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The Commonwealth of Massachusetts

BOARD OF ELEVATOR REGULATIONS

524 CMR

Office of the Secretary of State
Michael Joseph Connolly, Secretary

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The Commonwealth of Massachusetts

SECRETARY OF STATE

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   BOARD OF ELEVATOR REGULATIONS

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   ALL REGULATIONS OF THE BOARD

Under the provisions of Massachusetts General Laws, Chapter 30A, Section 6 and Chapter 233, Section 75, this document may be used as evidence of the original documents on file with the State Secretary.

Compiled as in full force and effect: 9/1/93

A true copy attest:

Michael J. Connolly

MICHAEL JOSEPH CONNOLLY
Secretary of State

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2.06: Procedure for the Adoption, Amendment or Repeal of Regulations Where a Public Hearing Is Required
2.07: Availability of Regulation
2.08: Filing of Regulation
2.09: Advisory Ruling

2.01: Definition of Regulation

(1) The following rules govern the procedures to be followed by the Board subject to the State Administrative Procedure Act when promulgating regulations (M.G.L. c. 30A, §§ 2 and 3). The term "regulation" is defined by the Act as "the whole or any part of every rule, regulation, standard or other requirement of general application and future effect adopted by an agency to implement or interpret the law enforced or administered by it." (M. G. L. c. 30A, § 1(5)). "Regulation" does not, however, include advisory rulings, rules relating to the internal management of the Board and not directly related to the rights or procedures available to the public, or decisions rendered in adjudicatory proceedings. Accordingly, these rules apply to agencies which are acting in a quasi-legislative capacity, i.e. either promulgating substantive regulations consistent with applicable statutes or promulgating rules governing their own procedures. Where these rules apply, the Board may not waive or otherwise modify them except to the extent specifically provided herein

(2) It shall be the policy of the Board of Elevator Regulations to require a report and recommendation for action by the assigned state elevator inspector on all applications before the Board. No action shall be taken by the Board on any such application until the report and recommendations by the assigned state elevator inspector have been filed and made available to members of the Board; provided, however, that the Board may, with the unanimous consent of the members present and voting at any regularly scheduled meeting, waive this requirement based on a showing of extreme hardship that could result from any delay in the board's decision pending the receipt of such report and recommendation.

2.02: Petition for Adoption of Regulations

Any interested person or his attorney may at any time petition the Board to adopt, amend or repeal any regulation. The petition shall be addressed to the Board and sent to the Chairman by mail or delivered in person during normal business hours. All petitions shall be signed by the petitioner or his attorney, contain his address or the address of his attorney, and set forth clearly and concisely the text of the proposed regulation. The petition may be accompanied by any supporting data, views or arguments.

2.03: Initial Procedure to Handle Recommended Regulations

Upon receipt of a petition for the adoption, amendment or repeal of a regulation submitted pursuant to 524 CMR 2.02 or upon written recommendation by a member of the Board that a regulation be adopted, amended or repealed, the Board shall consider the petition or recommendation forthwith and shall, thereupon, determine whether to schedule the petition or recommendation for further proceedings in accordance with 524 CMR 2.05 or 2.06. If the regulation has been presented to the Board by petition under 524 CMR 2.02, the Board shall within ten days after the next scheduled meeting of the Board after the receipt of the petition, notify the petitioner of the Board's action.

2.04: Participation at Preliminary Meeting

During the meeting referred to in 524 CMR 2.03, the Board may, but shall not be required to, entertain comments or questions from members of the audience. The Chairman or other presiding officer may at any time terminate participation by the audience.

2.05: Procedure for the Adoption, Amendment or Repeal of Regulations Where No Public Hearing is Required

(1) Notice. Notice of the proposed action to adopt regulations shall be given by the Board at least 21 days prior to its proposed action, unless some other time is specified by any applicable law. The Board shall publish the notice in at least one newspaper in each of the cities of Boston, Worcester, Springfield, Fall River, Lowell and Lynn and where appropriate, in such trade, industry or professional publications as the Board may select. The Board shall likewise notify in writing any person specified by any law and any person or group which has filed request for notice pursuant to M. G. L. c. 30A, § 3(1)(b). The notice shall contain the following:

(a) The Board's statutory authority to adopt the proposed regulation.

(b) The procedure for submitting data, views or arguments as set forth in 524 CMR 2.05(2).

(c) The test of the proposed regulation. (If the proposed regulation is lengthy, it need not be set out verbatim; however, the notice should either describe the substance of the proposed regulation or state the subject matter and issues involved.)

(d) Any additional matter required by any law. The above notwithstanding, the Board shall also comply with any applicable statute which contains provisions for notice which differ from those contained herein.

(2) Procedure. Within 21 days after the publication and sending of notice regarding the proposed action, any interested person may submit a signed letter, brief or other memorandum stating his views or argument concerning the proposed action. The letter, brief or memorandum shall be addressed to the Board and sent to the Chairman by mail or delivered in person during normal business hours. The Board at its next scheduled meeting shall consider the proposed action. Within 30 days after the Board's meeting the Board shall give written notice of the disposition of the proposed action to all persons required to receive personal notice under 524 CMR 2.05(1) and such other persons submitting a letter, brief, or other memorandum.

(3) Oral Participation. The Board may afford any interested person or his duly authorized representative, or both, an opportunity to present data, views or arguments orally before the Board during the meeting at which the proposed action is to be considered. If the Board finds that such oral presentation is unnecessary or impractical, it may require written presentation according to 524 CMR 2.05(2).

(4) Waiver of Notice and Participation. If the Board finds that the requirements of notice and opportunity to present views on its proposed action are unnecessary, impractical or contrary to the public interest, the Board may dispense with such requirements or any part thereof. The Board's finding and a brief statement of the reasons for its finding shall be incorporated in the regulation, amendment or repeal as filed with the Secretary of State under 524 CMR 2.08.

2.06: Procedure for the Adoption, Amendment or Repeal of Regulations Where a Public Hearing is Required

(1) Notice. Notice of a public hearing shall be given at least 21 days prior to the date of the hearing, unless some other time is specified by any applicable law. The Board shall publish the notice in at least one newspaper in each of the cities of Boston, Worcester, Springfield, Fall River, Lowell and Lynn and where appropriate, in such trade, industry, or professional publications as the agency may select. The Board shall likewise notify in writing any person specified by law and any person or group which has filed written request for notice pursuant to M.G.L. c. 30A, § 2(1)(b). The notice shall contain the following:

(a) The Board's statutory authority to adopt the proposed regulation.

(b) The time and place of the public hearing.

2.06: continued

(c) The text of the proposed regulation. (If the proposed regulation is lengthy, it need not be set out verbatim; however, the notice should either describe the substance of the proposed regulation or state the subject matter and issues involved.)

(d) Any additional matter required by law.

The above notwithstanding, the Board shall also comply with any applicable statute which contains provisions for notice which differ from those contained herein.

(2) Procedure. On the date and at the time and place designated in the notice referred to in 524 CMR 2.06(1), the Board shall hold a public hearing at which a hearing officer as defined by 524 CMR 1.09(2) or a majority of the Board shall be present. The meeting shall be opened, presided over and adjourned by a hearing officer as defined by 524 CMR 1.09(2) or by the Chairman of the Board or other members of the Board designated by the Chairman of the Board or other members of the Board designated by the Chairman of that Board. Within ten days after the close of the public hearing, written statements and arguments may be filed with the Board. The Board shall consider all relevant matter presented to it before adopting, amending or repealing any regulation.

(3) Oral Participation. Any interested person or his duly authorized representative, or both, shall be given an opportunity to present orally statements and arguments. In its discretion the Board may limit the length of oral presentation.

(4) Emergency Regulations. If the Board finds that the immediate adoption of a regulation is necessary for the public health, safety or general welfare, and that observance of requirements of notice and public hearing would be contrary to the public interest, the Board may dispense with such requirements and adopt the regulation as an emergency regulation. The Board's finding and a brief statement of the reasons for its finding shall be incorporated in the emergency regulation as filed with the Secretary of State in accordance with 524 CMR 2.08. Any emergency regulation so adopted shall state the date on which it is to be effective and the date on which it shall expire. If no effective date is stated, the regulation shall be presumed to take effect upon being filed with the Secretary of State under 524 CMR 2.08. An emergency regulation shall not remain in effect for longer than three months unless during the time it is in effect the Board gives notice and holds a public hearing and adopts it as a permanent regulation in accordance with 524 CMR 2.00.

2.07: Availability of Regulation

The Chairman of the Board shall be responsible for keeping a book containing all of the Board's regulations. In addition, the Board shall compile and publish the regulations which are currently in effect. All the regulations of the Board shall be available for inspection during normal business hours at the Office of the Commissioner, Department of Public Safety, 1010 Commonwealth Avenue, Boston, Massachusetts. Copies of all regulations shall be available to any person on request. The Department may charge a reasonable fee for each copy.

2.08: Filing of Regulation

Upon the adoption of a regulation, an attested copy shall be filed with the Secretary of State together with a citation of the statutory authority under which the regulation has been promulgated. The regulation shall take effect upon filing unless a later date is required by any law or is specified by the Board in the regulation.

2.09: Advisory Ruling

Any interested person or his attorney may at any time request an advisory ruling with respect to the applicability to any person, property or factual situation of any statute or regulation enforced or administered by the Board. The request shall be addressed to the Board and sent to the Chairman by mail or delivered in person during the normal business hours. All requests shall be signed by the person making it or his attorney, contain his address or the address of his attorney, and state clearly and concisely the substance or nature of the request. The request may be accompanied by any supporting data, views or arguments. Upon receipt of the request, the Board, at its next scheduled meeting shall consider it and shall within ten days thereafter notify the petitioner that the request is denied or that the Board will render an advisory ruling. If an advisory ruling is rendered, a copy of the ruling shall be sent to the person requesting it or his attorney.

REGULATORY AUTHORITY

524 CMR 2.00: M.G.L. c. 30A, §§ 2 & 3.

524 CMR 3.00: ELEVATOR, ESCALATOR, DUMB-WAITER AND MOVING WALK INSTALLATIONS (BEFORE MARCH 9, 1950): GENERAL

Section

3.01: Definitions
3.02: General Requirements

Pursuant to the provisions of M.G.L. c. 143, § 69, the Board of Elevator Regulations adopts the following regulations (524 CMR 3.00 through 11.00) applicable to elevator, escalator, dumb-waiter and moving walk installations for which application for approval of plans or permit for construction was filed prior to March 9, 1950 (*).

3.01: Definitions

In 524 CMR 3.00 through 10.00 the following terms shall have the meanings respectively assigned to them. They are not intended, however, as a complete glossary of terms used in connection with elevator installations.

Annunciator: Elevator Car. An elevator car annunciator is an electrical device in the car, which indicates the landings at which hall buttons have been pressed.

Buffer. A buffer is a device to absorb the impact of the car or counterweight at the extreme limits of travel.

Capacity. The capacity of an elevator is the load which the elevator is designed and equipped to adequately handle as determined by 524 CMR or by the inspector having jurisdiction.

Car, Elevator. An elevator car is the load-carrying unit, including its platform, car frame and enclosure.

Car Door or Gate. A car door or gate is the door or gate attached to the elevator car which closes the opening regularly used for entrance and exit.

Car Door or Gate Electric Contact. A car door or gate electric contact is a device which opens the operating circuit, or an auxiliary circuit, when the car door or gate is open beyond the closed position and thus prevents operation of the elevator car by the operating devices.

Car Enclosure. The car enclosure or cab of an elevator is the enclosure consisting of walls and the top or cover built upon the platform.

Car Frame or Car Sling. A car frame or car sling is the supporting frame to which the car platform upper and lower sets of guide shoes and the hoisting ropes are attached.

Car Platform. The car platform is the structure which forms the floor of the car and which directly supports the load.

Clearance, Bottom Car. Bottom clearance of the elevator car is the clear vertical distance between the underside of the car platform or between the underside of any equipment attached thereto, exclusive of the car frame channels, car safety blocks, guide shoes and any aprons or guards attached to the car sill, and the pit floor when the car rests on the fully compressed buffer.

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* Regulations ELV-2 (524 CMR 15.00 through 33.00) pertaining to new construction of elevators, dumb-waiters, and moving stairways (escalators) were filed by the Board of Elevator Regulations and became effective March 9, 1950.

3.01: continued

Clearance, Top Car. Top clearance of the elevator car is the distance the car floor can travel above the level of the upper terminal landing without any part of the car or devices attached thereto coming in contact with the overhead structure.

Clearance, Top Counterweight. Top clearance of the elevator counterweight is the shortest vertical distance between any part of the counterweight structure and the nearest part of the overhead structure or any other obstruction when the car floor is level with the lower terminal landing.

Clearance, Bottom Counterweight. The bottom clearance of the counter-weight is the vertical distance between the counterweight buffer and its striker plate when the car is level with the top terminal landing.

Control. The control of an elevator is a system of regulation by which the starting, stopping, direction of motion, acceleration, speed, and retardation of an elevator are governed.

Control, Generator-Field. Generator-field control is a system in which control is primarily accomplished by the use of an individual generator for each elevator, in which the voltage applied to the hoisting motor is adjusted by varying the strength and direction of the generator-field.

Control, Multi-Voltage. Multi-voltage control is a system in which control is accomplished primarily by impressing successively on the armature of the hoisting motor a number of substantially fixed voltages such as may be obtained from multi-commutator generators common to a group of elevators.

Control, Rheostatic. Rheostatic control is a system in which control is accomplished primarily by varying resistance or reactance in the armature or field circuit of the hoisting motor.

Control, Two-Speed Alternating Current. Two-speed, alternating current elevator control is a control for a two-speed induction elevator motor which is arranged to run at two different, practically constant speeds, by connecting the motor winding so as to obtain different numbers of poles.

Control, Variable Voltage. (Same as generator-field control).

Controller, Electric Elevator. An electric elevator controller is a device, or a group of devices, which serves to govern, in some predetermined manner, the electric power delivered to the apparatus to which it is connected.

Dispatching Device, Automatic. An automatic dispatching device is a device whose principal function is to automatically operate a signal in the car to indicate when the car should leave the terminal.

Door Closer. A door closer is a device, operated by gravity or other means, which will automatically close a door when released by the operator or by suitable automatic means.

Door or Gate Device, Power-Operated. A power-operated door or gate device is a device or assemblage of devices, the purpose of which is to open or close the hoistway door or car door or gate by power other than by hand, gravity, springs or the movement or the car.

Door Operator, Elevator Electric. An elevator electric door operator is an electric device for operating the hoistway or car doors, or both.

Dumb-waiter. A dumb-waiter is a hoisting and lowering mechanism equipped with a car which moves in guides in a substantially vertical direction; the floor area of which does not exceed nine square feet, whose total internal car height whether or not provided with fixed or removable shelves does not exceed four feet; the capacity of which does not exceed 500 lbs. and which is used exclusively to transport material in a substantially vertical direction.

3.01: continued

Dumb-waiter, Electric. An electric dumb-waiter is one in which the motion of the car is obtained through an electric motor directly applied to the dumb-waiter machinery.

Elevator. An elevator is a hoisting and lowering mechanism for the transportation of persons or materials, which is equipped with a car or solid level platform moving in guides at an angle of 30° or less from the vertical, which serves two or more fixed landings (including balconies and mezzanines) on the inside or outside of a building or structure, and which shall be enclosed and equipped as required.

Elevator, Automatic Push Button Electric. An electric automatic push button elevator is one that is started by means of momentary pressure of push buttons at the landings with or without push buttons in the car, and whose landing stops are automatic.

Elevator, Auxiliary Power. An auxiliary power elevator is one having a source of mechanical power in common with other machinery.

Elevator, Builder's Hoist. A builder's hoist elevator is an elevator erected for temporary use, built in or adjoining a building under construction or alteration.

Elevator, Continuous Pressure. A continuous-pressure electric elevator is one operated by means of push buttons or switches at the landings with or without push buttons in the car which requires a button or switch to be held manually in contact to keep the car in motion.

Elevator, Double-Belted. A double-belted elevator is an auxiliary power elevator in which the direction of motion is changed without reversal of the prime mover.

Elevator, Electric, An electric elevator is one in which the motion of the car is obtained through an electric motor directly applied to the elevator machinery.

Elevator, Alternating Current. An alternating current elevator is an electric elevator equipped with an alternating current motor directly applied to the elevator machinery.

Elevator, Electro-Hydraulic. An electro-hydraulic elevator is one in which the lifting of the car is obtained by means of an electric motor driving a pump which pumps liquid directly into the cylinder.

Elevator, Freight. A freight elevator is an elevator used primarily for carrying freight.

Elevator, Gravity. A gravity elevator is an elevator in which gravity is the source of power.

Elevator, Hand. A hand elevator is an elevator driven by manual power.

Elevator, Hoistway. A hoistway elevator is an elevator running through floor openings provided with hoistway covers (hatch covers), each of which is opened automatically as the car approaches the landing and is closed automatically as the car leaves the landing.

Elevator, Hydraulic. A hydraulic elevator is an elevator in which the motion of the car is obtained from liquid under pressure.

Elevator, Passenger. A passenger elevator is an elevator that is used to carry persons other than the operator and persons necessary for loading and unloading.

Elevator, Platform. A platform elevator is an elevator the platform of which is directly supported at three or more points by suspension members which are relied upon to maintain the platform substantially level.

Elevator, Plunger. A plunger elevator is a hydraulic elevator having a ram or plunger directly attached to the under side of the car platform.

3.01: continued

Elevator, Power. A power elevator is an elevator in which the motion of the car is obtained through the application of energy other than by hand or gravity.

Elevator, Private Residence. A private residence elevator is a passenger elevator serving only a single family, installed in a residential building, and having a contract load not in excess of 700 lbs., and a contract speed not in excess of 50 feet per minute.

Elevator, Rope Geared Hydraulic. A rope geared hydraulic elevator is one in which the motion of the car is obtained by multiplying the travel of a piston or ram by a system of sheaves over which the hoisting ropes operate.

Elevator, Self-Service. A self-service elevator is one that is started by means of momentary pressure of push buttons at the landings, with or without push buttons in the car, and whose landing stops are automatic. An elevator shall not be deemed to be self-service if an operator has been permanently or regularly assigned to its operation.

Elevator, Sidewalk. A sidewalk elevator is an elevator the upper hatch opening of which is located either partially or wholly outside the building and which has no opening into the building at its upper terminal landing.

Elevator, Signal Operation. See "SIGNAL OPERATION".

Elevator, Steam. A steam elevator is an elevator in which the motion of the car is obtained from a steam engine directly applied to the elevator machinery.

Emergency Release. An emergency release is a device the purpose of which is to make inoperative door or gate electric contacts or door interlocks in case of emergency.

Emergency Stop Switch. An emergency stop switch is a device in the car used to cut off the power from the elevator machine and brake independently of the position of the operation devices.

Escalator. An escalator is a moving inclined continuous stairway or runway used for raising or lowering persons.

Escalator, Electric. An electric escalator is one in which the motion is obtained through an electric motor directly applied to the escalator machinery.

Existing Installation. An existing installation is an elevator or moving stairway, for which a permit was issued for its erection, to increase its speed, to increase its capacity, to extend its travel, or to relocate its machine room, before the effective date of 524 CMR 3.00 through 11.00.

Hoistway. A hoistway is any opening or series of vertical openings in one or more floors of a building through which one elevator or dumb-waiter operates.

Hoistway Door or Gate. A hoistway door or gate is the hinged or sliding portion of the hoistway enclosure which closes the opening giving access to the elevator or dumb-waiter car at any landing.

Hoistway Door or Gate, Bi-parting. A bi-parting door or gate is a vertical slide, horizontal slide, or swing door or gate consisting of two or more sections so arranged that the sections, or pairs of sections, open away from each other, and so interconnected that both sections operate simultaneously.

Hoistway Door or Gate, Full Automatic. A full automatic door or gate is a vertically-moving door or gate which is opened directly by the motion of the elevator car approaching any landing and closed by gravity as the car leaves any landing.

3.01: continued

Hoistway Door or Gate, Manually Operated. A manually operated door or gate is a door or gate which is opened and closed by hand.

Hoistway Door or Gate, Power-Operated. A power-operated door or gate is a door or gate which is opened or closed by power other than by hand, gravity, springs, or the movement of the car, and is further defined as follows:

Power-Closed Door or Gate. A power-closed door or gate is a door or gate which is manually opened and is closed by power other than by hand, gravity, springs, or the movement of the car.

Power-Opened, Self-Closing Door or Gate. A power-opened self-closing door or gate is a door or gate which is opened by power other than by hand, gravity, springs, or the movement of the car, and is closed by energy stored during the opening operation.

Power-Operated Door or Gate, Automatically Opened. A power-operated door or gate, automatically opened, is a door or gate which is opened other than by hand, gravity, springs, or the movement of the car, the opening of the door being initiated by the arrival of the car at or near the landing. The closing of such door or gate may be under the control of the elevator operator or may be automatic.

Self-Closing Door or Gate. A self-closing door or gate is a door or gate which is opened manually and closes when released.

Semi-Automatic Door or Gate. A semi-automatic door or gate is a door or gate which is opened manually and which closes automatically as the car leaves the landing.

Hoistway Door or Gate Electric Contact. A hoistway door or gate electric contact is a device, the purpose of which is to open the operating circuit, or an auxiliary circuit, unless the hoistway door or gate at which the car is standing is in the closed position, and thus prevents operation of the elevator by the operating devices in a direction to move the car away from the landing.

Hoistway Enclosures. The fixed structure consisting of vertical walls or partitions which isolates the hoistway from all other parts of the building or from an adjacent hoistway and in which the hoistway doors and door assemblies are installed.

Hoistway, Elevator or Dumb-waiter. A shaftway for the travel of one or more elevators or dumb-waiters. It includes the pit and terminates at the underside of the overhead machinery space floor or grating, or at the underside of the roof where the hoistway does not penetrate the roof.

Hoistway or Shaftway Enclosure. A hoistway or shaftway enclosure is any structure which separates the hoistway or shaftway, either wholly or in part, from the floors or landings through which the hoistway or shaftway extends.

Hoistway Door Interlock. A hoistway door interlock is a device, the purpose of which is:

First: To prevent the operation of the elevator machine by the operating devices in a direction to move the car away from a landing unless the hoistway door at that landing at which the car is stopping or is at rest is locked in the closed position.

Second: To prevent the opening of the hoistway door from the landing side; unless the car is at rest within the landing zone, or is coasting through the landing zone with its operating device in the stop position.

Door Unit System is an interlocking system which meets the requirements of the interlock definition above, but does not require all the hoistway doors to be locked in the closed position.

3.01: continued

Hoistway Unit System is an interlock system which, in addition to fulfilling the requirements given under the definition of interlock, will also prevent the operation of the car by the operating devices unless all hoistway doors are locked in the closed position.

Inching Device. An inching device is a set of "up" and "down" continuous-pressure buttons located on the car arranged to permit the manual operation of the car when within the inching zone toward the landing level where the landing doors, or gates, or the car doors or gates, are not in the locked or closed position.

Inching Zone. A car is considered within the meaning of 524 CMR 3.00 through 11.00 as being within the inching zone when the car is eight inches below any landing, or eight inches above any landing.

Landing, Elevator. An elevator landing is that portion of a floor, balcony, or platform used to receive and discharge passengers or freight.

Landing Zone. A car is considered within the meaning of 524 CMR 4.00 through 11.00 as being within the landing zone when the car floor is not more than 18" above or below the landing.

Leveling Device. A car-leveling device is any mechanism or control which will automatically move the car within a limited zone toward, and stop the car, at the landing.

Load. Load is the rated capacity in pounds specified in the contract for the purchase of the elevator and in the application for the permit.

Machine, Elevator. An elevator machine is the machinery and its equipment used in raising and lowering the elevator car or platform, and is further defined as follows:

Machine, Chain-Driven. A chain-driven elevator machine is an elevator machine connected to a reversible motor, engine, or turbine by a chain.

Machine, Direct-Drive. A direct-drive machine is one in which the driving motor is connected directly to the driving sheave or drum with or without intermediate mechanism or gears.

Machine, Single-Belted. A single-belted elevator machine is an elevator machine connected to a reversible motor, engine or turbine by a belt.

Machine, Double Belted. A double-belted elevator machine is an elevator connected to a non-reversible prime mover by two belts through which the direction of motion is changed.

Machine, Spur-Geared. A spur-geared machine is one in which power is transmitted to the driving sheaves or drum through spur gearing.

Machine, Traction. A traction machine is an elevator machine in which the motion of the car is obtained through friction between the hoisting ropes and the traction sheave.

Geared-Traction. A geared-traction machine is a traction machine which employs gearing between the electric motor and the traction sheave.

Gearless-Traction. A gearless-traction machine is a traction machine which has the traction sheave and the brake drum mounted directly on the electric motor shaft.

Machine, Winding-Drum. A winding-drum machine is an elevator machine in which the ropes are fastened to and wind on a drum.

Machine, Worm-Geared. A worm-geared machine is one in which the power is transmitted to the driving sheaves or drum through worm gearing.

3.01: continued

Main Line Circuit Switch. A main line circuit switch is a solenoid switch connected to open the line circuit of the motor and the brake release magnet coil.

Material Change. The following shall be considered material changes:
(a) if the speed of an existing elevator is increased;
(b) if the capacity of an existing elevator is increased;
(c) if the travel of an existing elevator is extended;
(d) if the machine room of an existing elevator is relocated; and
(e) if the classification of an elevator is changed from freight to passenger.

Moving Stairway. (See "Escalator")

New Installation. A new installation is any installation for which application for approval of plans or a permit for construction is filed on or after the effective date of 524 CMR 3.00 through 11.00; any installation which is re-located; any installation which is materially changed.

Non-Stop Switch, Elevator. A non-stop switch is a switch which when thrown will prevent the elevator from making hall stops and will automatically transfer these hall stop signals to the next car following, or, where no other car is provided, hold the floor stop calls registered until the elevator answers them.

Oil Buffer Stroke. The stroke of an oil buffer is the oil-displacing movement of the buffer plunger or piston, and does not include the travel of the buffer plunger accelerating device.

Operating Devices. The operating device is the car switch push button, or other device employed to enable the operator to actuate the controller.

Operation. Operation is the method of actuating the controller by the operating devices.

Automatic Operation. Automatic operation is operation by means of buttons or switches at the landings, with or without buttons or switches in the car, the momentary pressing of which will cause the car to start and automatically stop at the landing corresponding to the button pressed.

Non-Selective Collective Automatic Operation. Non-selective collective automatic operation is automatic operation by means of one button in the car for each landing level served and one button at each landing, wherein all stops registered by the momentary pressure of landing or car buttons are made irrespective of the number of buttons pressed or of the sequence in which the buttons are pressed. With this type of operation the car stops at all landings for which buttons have been pressed, making the stops in the order in which the landings are reached after the buttons have been pressed but irrespective of its direction of travel.

Selective Collective Automatic Operation. Selective collective automatic operation is automatic operation by means of one button in the car for each landing level served and by "up" and "down" buttons at the landings, wherein all stops registered by the momentary pressure of the car buttons are made as defined under non-selective collective automatic operation, but wherein the stops registered by the momentary pressure of the landing buttons are made in the order in which the landings are reached in each direction of travel after the buttons have been pressed. With this type of operation, all "up" landing calls are answered when the car is traveling in the "up" direction and all "down" landing calls are answered when the car is traveling in the "down" direction, except in the case of the uppermost or lowermost calls, which are answered as soon as they are reached, irrespective of the direction of travel of the car.

Single Automatic Operation. Single automatic operation is automatic operation by means of one button in the car for each landing level served and one button on each landing, so arranged that if any car or landing button has been pressed the pressure of any other car or landing operating button will have no effect on the operation of the car until the response to the first button has been completed.

3.01: continued

Car-Switch Operation. Car-switch operation is operation wherein the starting, direction of motion, and the stopping of the car are directly and solely under the control of the operator by means of a self-centering switch or by constant pressure buttons in the car.

Car-Switch Automatic Floor-Stop Operation. Car-switch automatic floor-stop operation is operation in which the stop is initiated by the operator from within the car with a definite reference to the landing at which it is desired to stop, after which the slowing down and stopping of the elevator is automatically effected.

Continuous Pressure Operation. Continuous pressure operation is operation by means of push buttons or switches at landings with or without buttons in the car; any one of which may be used to control a movement of the car so long as the button or switch is manually held in the operating position.

Dual Operation. Dual operation is a system of operation whereby the controller of an automatic operation elevator is arranged so that on the throwing of a transfer switch the starting of the car is solely under the control of an operator in the car. Landing stops may be either automatic or under the control of the operator.

Pre-Register Operation. Pre-register operation is operation in which signals to stop are registered in advance by buttons in the car and at the landings. At the proper point in the car travel the operator in the car is notified by a signal, visual, audible, or otherwise, to initiate the stop, after which the landing stop is automatic.

Signal Operation. Signal operation is operation by means of single buttons or switches, or both, in the car, and up or down direction buttons, or both, at the landings, by which predetermined landing stops may be set up or registered for an elevator or for a group of elevators. The stops set up by the momentary pressure of the car buttons are made automatically in succession as the car reaches these landings, irrespective of its direction of travel or the sequence in which the buttons are pressed. The stops set up by the momentary pressure of the up and down buttons at the landing are made automatically by the first available car in the group approaching the landing in the corresponding direction, irrespective of the sequence in which the buttons are pressed. With this type of operation, the car can be started only by means of a starting switch or button in the car.

Overhead Structure. The overhead structure is all the structure and platforms which support the elevator equipment at the top of the hoistway.

Overtravel, Bottom. Bottom overtravel of the elevator car is the distance the car floor can travel below the level of the lower terminal landing until the weight of the fully loaded car rests on the buffers, and includes the resulting buffer compression. Bottom overtravel of the counterweight is the distance the counterweight can travel below its position when the car platform is level with the upper terminal landing until the full weight of the counterweight rests on the buffers, and includes the resulting buffer compression.

Overtravel, Top. Top overtravel of the elevator car is the distance the car floor can travel above the level of the upper terminal landing until the counterweight buffer is fully compressed.

Panelboard. A single panel or a group of panel units designed for assembly in the form of a single panel; including buses, and with or without switches and/or automatic overcurrent protective devices for the control of light, heat or power circuits of small individual as well as aggregate capacity; designed to be placed in a cabinet or cutout box placed in or against a wall or partition and accessible only from the front. (See "Switchboard") (5-21-59)

Position Indicator. A position indicator is a device which indicates the position of the elevator car in the hoistway. It is called a hall position indicator when placed in the hall or a car position indicator when placed in the car.

3.01: continued

Potential Switch, Elevator. An elevator potential switch is a magnetic-type switch which disconnects the power from the elevator apparatus when the supply voltage fails or decreases below a definite value and which is usually opened by various electrical safety devices.

Runby, Top. The top runby of the elevator car is the distance the car floor can travel above the level of the upper terminal landing until the counterweight strikes the counterweight buffer.

Safety, Car or Counterweight. A car or counterweight safety is a mechanical device attached to the car or counterweight frame to stop and hold the car or counterweight in case of predetermined overspeed, free fall, or through slackening of the ropes.

Safety Governor. A safety governor is a device which, together with the governor safety ropes, is designed to set the car or counterweight safeties at a predetermined rate of overspeed.

Safety Plank. A safety plank is the lower structural member of the car frame which supports the car platform and includes the car safety, its actuating mechanism and the lower set of guide shoes.

Shaftway. A shaftway is any opening or series of vertical openings in one or more floors of a building through which one or more than one elevator or dumb-waiter operates.

Shaftway or Hoistway Enclosure. A shaftway or hoistway enclosure is any structure which separates the shaftway or hoistway, either wholly or in part, from the floors or landings through which the shaftway or hoistway extends.

Shutdown Device, Elevator Automatic. An elevator automatic shutdown device is one that automatically disconnects the elevator apparatus, usually the motor-generator set, after the elevator has remained stopped for a definite time interval, which time interval may be adjustable.

Signal Button, Elevator Hall. An elevator hall signal button is a push button placed in the elevator hallways, by momentary pressure of which a stop signal is registered in the car.

Signal Device, Elevator Car Flash. An elevator car flash signal device is one providing a signal light in the car, which is illuminated when approaching the landings at which hall buttons have been pressed.

Signal System, Elevator Separate. An elevator separate signal system is one providing push buttons in the hallways, which, when momentarily pressed by a person desiring elevator service, indicate in the car where the operator is to stop, by illuminating a flash signal or operating an annunciator.

Signal Transfer Device, Elevator Automatic. An elevator automatic signal transfer device is one used with manually operated elevators, by means of which the signal is automatically transferred to the next car following, in case a car passes a set signal without making a stop.

Signal Transfer Switch. A signal transfer switch is a switch in the car which may be thrown by the operator when the car is filled or when, for some other reason, it is desirable to pass a signal, and which thereby transfers the signal to the next car approaching in the same direction.

Slack-Rope Switch, Elevator. An elevator slack-rope switch is a device for automatically cutting off the power in case the hoisting ropes become slack.

Special Retarding Device or Speed Control. A special retarding device or speed control is a slowdown device or speed control is a slowdown device so arranged that when the elevator does not slow down to a predetermined speed when approaching a terminal landing an emergency retarding force is applied.

3.01: continued

Speed. Speed is the contract speed in feet per minute, specified in the purchase contract or in the application for permit, to be attained by the elevator in the up direction with contract load in the car.

Starter's Panel, Elevator. An elevator starter's panel is an assembly of devices by means of which the starter is kept informed of the condition of the elevator service. This panel is generally located in the elevator hallway on the main entrance level.

Stroke of Oil Buffer. See "Oil Buffer Stroke".

Switchboard. A large single panel, frame or assembly of panels, on which are mounted, on the face or back, or both, switches, overcurrent and other protective devices, buses and usually instruments. Switchboards are generally accessible from the rear as well as from the front and are not intended to be installed in cabinets. (See "Panelboard") (5-21-59)

Terminal Stopping Device, Final. A final terminal stopping device is an automatic device for stopping the car and counterweight from contract speed, within the top clearance and bottom overtravel, independently of the operation of the normal terminal stopping device and the operating device.

Terminal Stopping Device, Normal. A normal terminal stopping device is an automatic device for stopping the elevator car at or near the terminal landings, independently of the operation of the operating device and the final terminal stopping devices.

Travel. The travel, or rise, of an elevator or dumb-waiter is the vertical distance between the bottom terminal landing and the top terminal landing.

Traveling Cable. An electric traveling cable is a cable made up of electric conductors, which provides electrical connection between the car and the stationary apparatus.

Waiting Passenger Indicator. A waiting passenger indicator is an indicator which shows, for a single elevator or a group of elevators, where and for which direction hall buttons have been pressed and also indicates when these calls have been answered. This indicator is usually located at the main lobby floor where it may be seen by the starter.

3.02: General Requirements

Where alterations, additions or changes result in an increase in the dead weight of the car or counterweight, they shall conform to the requirements of 524 CMR 3.00 through 11.00 governing the following:

(1) Machine beams, sheave beams, supporting beams, supports and foundations, ropes, suspension rope hitch supporting beams, hoist and counterweight ropes and governor connections.

(2) Car and counterweight guide rails.

(3) Car and counterweight buffers.

(4) Car frames, platforms, car safeties, counterweight safeties, if any, speed governors.

(5) When an elevator carries or is loaded or unloaded by an industrial power truck other than a hand truck, it shall comply with 524 CMR 17.15(3).

Repairs and replacement of damaged, broken or worn parts necessary for the safe operation of the equipment governed by 524 CMR 3.00 through 11.00 shall, unless otherwise prohibited herein, be made with parts of equivalent material, strength and design. Broken or damaged parts subject to tension, torsion or bending, or parts on which the support of the elevator car depends shall not be repaired by welding.

3.02: continued

(6) Fire Emergency Service - Automatic Passenger Elevators. All automatic passenger elevators having a travel of 70 feet or more from the lowest accessible grade elevation surrounding the building shall, as of the dates listed below, be provided with fire emergency service:

(a) New installation

(b) All elevators installed prior to June 7, 1972, shall as of January 1, 1980, comply with 524 CMR 17.39(2) through (5).

REGULATORY AUTHORITY

524 CMR 3.00: M.G.L. c. 143, § 69.

NON-TEXT PAGE

524 CMR 4.00: ALL ELEVATOR INSTALLATIONS MADE PRIOR TO MARCH 9, 1950 (OTHER THAN SIDEWALK ELEVATORS)

Section

4.01: Hoistway Construction and Landing Doors
4.02: Cars and Car Enclosures
4.03: Machines and Machinery
4.04: Ropes
4.05: Counterweights, Guide Rails and Buffers
4.06: Controlling Devices and Terminal Stops
4.07: Miscellaneous

4.01: Hoistway Construction

(1) Enclosures Around Elevator Hoistways in General.

(a) The hoistways of all elevators shall be enclosed throughout their height with walls of brick, or terra cotta, or wire lath and plaster, or wired glass set in metal frames or other fire-resisting construction, other than:

1. hoistway cover elevators,
2. elevators outside of buildings,
3. that part of a dumbwaiter hoistway located between the floor and a counter top.

(The details of construction including but not limited to thickness of walls, thickness, size and method of setting wired glass, shall conform to the local building requirements, if any, and otherwise to the requirements of the inspector having jurisdiction. All sash shall be stationary unless in the outer wall of the building. Frames and sash in the outer wall of the building may be of wood and the sash glazed with common glass if not conflicting with the local building requirements. Two or more elevators may be maintained in the same hoistway without partitions between them.)

(b) Elevator machine rooms in connection with hoistways enclosed with fire-resisting construction shall be enclosed, other than on the hoistway side, with enclosures of fireproof construction, or a fireproof partition shall be installed separating the machine from the hoistway, such partition being cut out only for ropes and machinery, and fitting closely around such ropes and machinery. Such enclosing partitions shall be in accordance with the regulations in effect at the time of the installation or alteration of the elevator or elevator machine room.

(c) Fire-resisting hoistway enclosures shall be extended through and at least three feet above the roof if the elevator serves the top story of the building, other than in the case of a dumbwaiter hoistway terminating under a counter top, and other than where a solid platform is located under the machinery and sheaves at the top of the hoistway entirely blocking it other than for the openings for ropes, unless otherwise permitted by law at the time of original installation.

(2) Skylights and Windows in Elevator Hoistways.

(a) If the fire-resisting hoistway enclosures continue through the roof, a skylight or skylights shall be located in the top of the hoistway, or a window or windows shall be located in the side walls of the enclosure, at the top, unless there is a solid platform at the top of the hoistway entirely blocking it other than for openings for ropes, conduits and pipes. The total glass area of such skylights or windows shall be in each case:

1. not less than one-half the area of the hoistway;
2. not less than three square feet if the area of the hoistway is three square feet or more; and
3. the full area of the hoistway if the latter is less than three square feet. The glass in the skylights and windows must be plain glass, not wired glass, or the skylights and windows must be arranged to open automatically to the required area by the fusing of fusible links inside of the hoistway near the top, in which case wired glass may be used. If plain glass is used in a skylight, the skylight shall be protected by a galvanized iron or steel netting of not more than one inch mesh, made of not less than No. 12 gage wire, supported on metal supports not less than six inches above the skylight.

NOTE: Effective 1/1/96 524 CMR 4.00 is repealed and replaced by 524 CMR 17.00.

4.01: continued

(b) If there is a solid platform under the machinery and sheaves at the top of the hoistway entirely blocking it other than for the openings for ropes, conduits and pipes, windows of construction and as nearly as possible the area specified in 524 CMR 4.01(2)(a) shall be installed in the hoistway immediately below such solid floor, and either in the outside wall of the building or above the roof. If there is no outside wall forming the hoistway, and if solid floor in the hoistway is not above the roof, no vent, skylights or windows will be required. Vent windows above the roof and below the solid floor in the hoistway need not be located so close to the roof as to interfere with roof flashing.

(c) Exterior windows in elevator hoistways shall be protected by vertical metal bars, not less than ⅝" in diameter, spaced and attached as required by 524 CMR 4.01(2)(d) and 4.01(2)(c).

(d) The bars shall be not more than ten inches on centers, nor shall there be more than ten inches between the window jamb and the center of the nearest bar.

(e) The bars shall be attached to the masonry where there is any, and in all cases firmly secured, and in such a manner that they will not readily become loosened through the action of the weather.

(f) Such bars, if of iron or steel, shall be kept thoroughly painted.

(3) Enclosures Around Elevator Hoistways in Stairwells. The hoistways of all elevators within the stairwellways of surrounding stairs shall be enclosed throughout the complete height of the building and vented to the outer air. The hoistway shall be of two-hour fire-rated construction.

Exception. Elevators in buildings where the elevator-stairwell enclosure including any openings therein is of two-hour noncombustible construction and the stairway is of noncombustible construction, and where there is one other accepted means of egress from the building from each floor, accessible without having to pass through said enclosure.

(4) Automatic Hoistway Covers and Enclosures Around Hoistways of Hoistway Cover Elevators and Platform Elevators.

(a) 524 CMR 4.01(4) shall apply to power and hand operated elevators.

(b) The unused sides of all hoistway openings shall be protected by guards which shall not be less than five feet six inches high and shall reject a two-inch ball.

(c) All landing openings shall be protected by gates which shall not be less than five feet six inches high and shall reject a two-inch ball.

(d) Automatic hoistway covers shall be made of not thinner than ⅞" stock, strongly battened, if of wood, or of equally strong and stiff metal construction.

(e) Wood automatic hoistway covers shall be covered on their under sides and on their edges with sheet or galvanized steel with locked joints, with nail heads concealed under the joints.

(f) Hinges on automatic hoistway covers shall be either heavy T or heavy strap hinges secured to the floor with lag-screws, or otherwise equally securely fastened and bolted through the hoistway covers.

(g) Hinged hoistway covers shall not be used on floor openings where the car has a clear platform area of more than 50 square feet, other than where permitted by law at the time of original installation.

(h) No hook or other means of fastening hoistway covers open shall be permitted.

(i) Where other than fireproof enclosures are built around the hoistways of hoistway elevators, the hoistway covers shall not be omitted on that account.

(j) The hoistways of all platform elevators shall be completely enclosed throughout their entire height with fire-resisting construction such as specified in 524 CMR 4.01(1)(a) unless otherwise permitted by law at the time of original installation.

(k) Subdivisions 524 CMR 4.01(1)(b); 4.01(1)(c); 4.01(2)(a) and 4.01(2)(b) shall be complied with insofar as they are applicable to hoistway enclosures of platform elevators, unless such hoistway enclosures complied with law at the time of original installation.

4.01: continued

(5) Enclosures Around Elevator Hoistways Outside of Building. The hoistway of an elevator located outside of a building shall be enclosed with a solid enclosure to a height seven feet above the ground. The remainder of the hoistway shall be enclosed throughout its height to six feet six inches above the top floor landing with a solid enclosure or with a grille work which will reject a ball two inches in diameter.

(6) Enclosures Around Counterweights.

(a) Counterweights running in isolated hoistways shall be enclosed throughout their height with fire-resisting construction or with sheet steel of not less than No. 16 gage, other than where located outside of buildings, in which case solid enclosures, not less than seven feet high, shall be installed. Where enclosures around such counterweights are not solid they shall be covered with wire netting of not larger than three-eighths inch square mesh, made of wire not smaller than No. 20 gage.

(b) The counterweight runs of elevators, except dumbwaiters and except hoistway elevators, shall be enclosed from a height of 12" above the bottom of the pit to a height not less than seven feet above the bottom of the pit, except where compensating chains or ropes would interfere and except where the bumpers under the counterweights are five feet or more high and except for elevators installed before June 19, 1914 where there is insufficient clearance.

(c) The material used for such enclosures in fireproof hoistways shall be noncombustible, and in any case, if made of open work, shall be of such design as shall reject a ½" ball.

(d) The counterweight runways of hoistway elevators, other than dumb-waiters, shall be boxed in from bottom of the pit to a point as close to the sheaves as practicable. The tops of such enclosures shall be covered other than for such openings as may be necessary for the ropes.

(e) Where the entire counterweight runway is boxed in, there shall be a removable section not less than two feet high and the full width of the boxing located above the top landing. If the elevator is of the hoistway cover type, the removable section shall be at such a height as to just clear the hoistway cover when open.

(f) In all cases the lower part of the counterweight enclosure shall be made removable from the top of the counterweight down.

(7) Openings and Set-Backs in Outside Walls of Freight Elevator Hoistways.
(524 CMR 4.01(8) does not apply to dumb-waiters.)

(a) Where the enclosing wall of the hoistway of a power freight elevator is the outside wall of a building, and where the elevator car is open toward this outside wall, the hoistway side of the outside wall shall be filled in, up to six feet six inches above the top landing level, with substantial incombustible material, the openings of which shall reject a four-inch ball wherever the clearance between the elevator car and the wall is more than four inches.

(b) Where the filling-in was done in accordance with law in existence at the time of construction and where there is no conflict with local building regulations, then the filling-in may be done with any form of construction giving a firm flush surface; or it may be done with wooden slats not less than three inches wide by ⅞" thick and set vertically not more than four inches apart; or it may be done with metal pipes or bars set vertically not more than four inches apart, provided that such slats, pipes or bars are strongly secured in place with no projections into the hoistway and with all cross bars and other supports other than close-fitting pipe clips, at the back of such slats, pipes or bars.

(c) Whatever form of construction is used for filling-in, the clearance between the face of the filling-in material and the car shall not be more than two inches.

(d) Window or other openings or recesses in such outside wall, other than the landing door openings, shall be filled in flush or slatted or barred as provided in 524 CMR 4.01(8)(c) whatever may be the clearance between the elevator car and the wall. The filling-in material shall be made flush with the wall or with the filling-in on the walls as the case may be.

4.01: continued

(8) Thresholds, Projections and Recesses.

(a) Strong and substantial bevelled metal or wood plates shall be located under all thresholds, beams and other fixed construction projecting into hoistways one inch or more beyond the general line of the hoistways of the elevator on sides where there are car openings, except where the elevator is equipped with solid riding doors or vertical lifting gates which will reject a two-inch ball if such doors or gates are equipped with electric contacts. Metal plates when not backed with wood shall be made of not less than No. 12 B. & S. gage metal. Bevelled plates on bi-parting doors shall be not less than No. 14 B. & S. gage metal and must be strongly reinforced. Recesses in hoistway enclosures on sides where there are car openings shall be filled in flush with the line of the hoistway or bevelled.

(Dumb-waiters are excepted from 524 CMR 4.01(9)(a)).

(b) The bevelled plates shall extend from the edge of the projection to the vertical wall, and the bevelled surfaces shall make an angle of not less than 60° with the horizontal.

(9) Clearance Between Cars, Counterweights and Hoistways. (524 CMR 4.01(10) does not apply to dumb-waiters and hand elevators.)

(a) There shall be a clearance of not less than ¾" between cars and the hoistway enclosures and a clearance of not less than one inch between cars and their counterweights.

(b) The clearance between the sill of car and the threshold of landing shall not be less than ¾" nor more than 1½".

(c) There shall be a clearance between elevator counterweights and the hoistways of not less than ¾".

(10) Landing Doors. (524 CMR 4.01(10) shall not apply to dumbwaiters unless otherwise provided.)

(a) Landing openings in solid fire-resisting hoistway enclosures shall be provided with fire-resisting landing doors and frames without open grille-work or other openings. Tinclad doors, rolling steel doors, Kalamein doors, hollow metal fire doors, steel frame doors glazed with wired glass, or doors of other similar construction shall be considered as "fire-resisting." Wired glass panels may be used in doors and shall conform to the following paragraphs:

1. Panels shall be of wired glass.
2. If used for power-operated hoistway doors, the wired glass panel shall be substantially flush with the surface of the landing side of the door.
3. When new vision panel openings are cut into existing doors they shall comply with the following:

The area of any single panel shall be not less than 25 square inches, and the total area of one or more panels in any hoistway door shall be not more than 80 square inches.

Each clear panel opening shall reject a ball six inches in diameter.

Vision panels in freight elevator doors installed previous to March 9, 1950 shall reject a ball six inches in diameter.

(b) Landing openings of all elevators in hoistways within the wellways of surrounding stairs shall be provided with landing doors made of fire-resistive construction, when they replace an existing unit.

All existing landing doors of the grille work type or others of not solid construction shall be made solid with non-combustible material or with steel panels not less than #17 U. S. Gauge thickness securely fastened and smooth on the landing side.

(c) Landing doors for passenger elevators shall slide in a horizontal direction or be of the swing type, and in either case shall be equipped with an electric interlock or a mechanical lock and an electric contact constructed as one integral unit and properly enclosed which will prevent the starting of the elevator when any landing door is open and will prevent the door from being opened when the elevator car is not at the landing. Hinged standing panels used to form a larger opening shall be equipped with electric contacts and shall be securely fastened at the top and bottom when closed.

4.01: continued

(d) Landing doors for freight elevators without landing gates, other than dumb-waiters, shall be equipped with hoistway door interlocks or with hoistway door mechanical locks and electric contacts which prevent the starting of the elevator when any landing door is open and prevent the door from being open when the elevator car is not at the landing.
(e) Where landing doors replace landing gates or landing doors on automatic push-button or continuous pressure-operated elevators, they shall be equipped with approved shaftway door interlocks as defined in 524 CMR 17.10(3) through 17.10(6).
(f) An emergency key or release shall be permitted only for the purpose of opening the lowest inside landing door from the landing side. This emergency key or release shall open this door only; and only when the car is within this landing zone, and shall open no other hoistway door. Such an emergency key shall be mounted in a "break-glass" receptacle and shall be clearly marked "Door key for emergency use only" and shall be located at the lowest inside landing.
(g) Landing doors or landing gates of elevators shall be set not more than four inches back from the thresholds so that no hardware, other than as required for interlock indicators, door operators and signal devices, shall extend into the hoistway beyond the line of any landing threshold. Extension or furring panels of elevators may be installed on the shaftway side of swing type landing doors and shall fill the opening with necessary clearances only between the walls or door frames and said panels. The sides of the panels shall be bevelled not less than 75° with the vertical. Panels shall be closed on the sides and top of substantially smooth construction securely fastened to the door and shall be fire-resisting. The distance between the back of the panel on the shaftway side and the edge of the threshold shall not be greater than four inches. Where doors or solid gates in two parts are used, in which the lower part, when open, forms the threshold, the door may project into the hoistway as may be necessary, provided that the lower edge of the lower half of the door is bevelled in accordance with 524 CMR 4.01(9)(a).
(h) Bi-parting counterbalanced doors shall have the lower edge of the upper door section provided with a fire-resistive, non-shearing, non-crushing member to provide a spacing of not less than three-quarters inch between the rigid members of the door sections when closed. Any rigid astragal overlapping the meeting edge is prohibited.
(i) Landing doors for dumb-waiters, where the bottom of the opening is not less than 18" above the landing floor, may be counterbalanced to stay open, but if the hoistway enclosures are of fire-resisting construction, fusible links are to be located inside of the hoistway, or at the lower edges of the doors, and so connected that upon the melting of the links the doors will close.
(j) Landing doors for dumb-waiters, where the bottom of the opening is less than 18" above the landing floor and the door opening is large enough to be mistaken for a doorway to stairs or to an adjacent room, shall be in two parts, one over the other, the lower of which shall extend at least 18" above the landing floor and shall be arranged to be opened only after the upper part has been opened, or gates which close when the car leaves the landings shall be installed in addition to the landing doors. The upper part of the two-part doors may be counterbalanced to stay open, and, if so, shall be provided with fusible links as in 524 CMR 4.01(10)(d).
(k) Dumb-waiters which are under counter tops at the upper limit of their travel are not required to have landing doors.
(l) Power-operated landing doors shall be arranged so that the closing motion of the door can be stopped by the operator at any point of its travel.
(m) Power-operated landing doors shall be equipped with interlocks

1. to prevent the starting of the elevator when any landing door is open, and
2. to prevent a door from being opened other than the door at the landing at which the car is standing at rest. The interlock shall not prevent the movement of the car when the car is being moved toward the landing by a car-levelling or inching device.

4.01: continued

(n) Means shall be provided to prevent the starting of any passenger elevator by the closing of the landing doors, unless the elevator is provided with a car gate or door with an interlocking device or electric contact.

(12) Landing Gates in General. (524 CMR 4.01(12) shall not apply to dumb-waiters.)

(a) Freight elevators having hoistway enclosures or guards shall be equipped with a gate. No gate shall be required at a landing opening where there is a landing door or a gate equivalent to a door and which is equipped with an electric interlock or a mechanical lock and an electric contact constructed as one integral unit and properly enclosed.

(b) Gates or doors shall be installed at all landing openings located outside of a building, even though such elevators have no hoistway enclosures.

(c) For elevators equipped with mechanical brakes, the gates or doors at landing openings shall be equipped with locking devices which will prevent the opening of the gates or doors from the landing side, and shall be arranged to close and lock automatically when the car leaves the landing. For elevators equipped with electric brakes, the gate or door shall be provided with an electric interlock or a mechanical lock and an electric contact constructed as one integral unit and properly enclosed to prevent the starting of the elevator until the door is closed and locked. The lock or interlocking mechanism shall be so located and installed that it cannot be reached from outside of the hoistway when the gate or door is closed. Such gates or doors must be kept closed and locked unless the elevator is in use at that landing.

(d) Hoistway gates, when closed, shall guard the full width of landing openings and shall extend from the landing threshold to a height of not less than five feet six inches, and all openings in gates shall reject a two-inch ball. It shall be permissible that the lowest bar shall be not more than two inches above the landing sill.

(e) A gate made in two or more parts which slide or telescope by each other in the same direction, may be used if the gate is solid or if the openings are three-eighths inch square or smaller, and if the edges of adjacent parts of the gates always lap so that the danger of injury due to shear is eliminated.

(f) Gates are to be made of metal or of hard wood of at least as great fiber strength as ash, and are to be strong and rigid and so constructed and installed that they cannot be sprung from their guides. Ribbon-type gates shall not be permissible.

(g) The joints of wood gate frames shall be strongly reinforced with metal plates.

(h) Gate shoes and runs on the operating side are to be of metal.

(i) No gate, when closed, is to be less than five feet and six inches in height, measured from the sill to the top of the upper horizontal member of the gate.

(j) Gate counterweights shall be boxed in or shall run in metal guides from which they cannot be readily dislodged. The bottoms of the boxes or of the guides shall be of such construction that the counterweights will be securely held if the counterweight rope should break.

(k) Collapsible gates shall not be permitted to guard the landing openings of elevators.

(13) Landing Openings in Outside Walls.

(a) Landing openings in outside walls shall be provided with solid gates or doors.

(b) The top of such a gate or door, when closed, shall not be less than six feet above the sill, and the bottom shall be not more than two inches above the sill.

(c) Where the elevator is set back in a vestibule or corridor with the landing opening not actually in the outside wall, but with an opening in the outside wall providing access to the landing opening, it shall be provided with a door or a gate not less than 5'6" in height and equipped with a locking or interlocking device as specified in 524 CMR 4.01(12)(c).

4.01: continued

(14) Landing Gates at Ground Openings of Elevators Outside of Building. Gates at the ground openings to elevators located outside of building shall not be less than six feet in height above the landing, and the bottom shall be not more than two inches above the landing, and shall be equipped with locking devices as specified in 524 CMR 4.01(12)(c). Such gates or doors must be kept closed and locked unless the elevator is in use at that landing.

(15) Pits and Thoroughfares Under Elevators.

(a) There shall be a pit at the bottom of the hoistways of power elevators which shall be at least three feet deep unless structurally impracticable in the opinion of the inspector having jurisdiction.

(b) If a car or counterweight does not run to the lowest floor of a building, and the space under the bottom of the hoistway of such car or counterweight is used for any purpose, the construction of the bottom of the hoistway under such car or counterweight shall be such as to withstand, without injury, the impact of the car loaded to its rated capacity and the impact of the counterweight, descending at the rated car speed, or at governor tripping speed where a speed governor is used. In addition, the counterweight shall be equipped with a safety device called for in 524 CMR 4.02(5)(c).

(16) Platform at Top of Hoistway.

(a) There shall be a platform immediately under the machinery and sheaves, if any, at the top of the hoistway of every elevator, other than dumb-waiters, hoistway elevators, and platform elevators. If permitted by law at the time of original installation, the platform at top of hoistway may be omitted if there is a cover on the car and the clearance between the cover and the platform is so small as to be a source of danger to a man on the car cover.

(b) The platform shall fill the hoistway if the latter has a cross-sectional area of 50 square feet or less; otherwise the platform need extend only two feet outside of all sheaves and machinery which should be reached for oiling and inspection.

(c) If the platform does not fill the entire hoistway, the edge of the platform shall be protected by a solid curbing at least six inches high, and where the space between the platform and the wall of the hoistway exceeds 12" there shall be a handrail securely fastened in place 3'6" above the platform.

(d) The platform shall be built and supported for a safe live load of not less than 50 lbs. per square foot.

(e) If the platform is made of steel grating, it shall be of such design as will reject a ball 1½" in diameter, and upon the upper side of the grating wire netting of not more than ⅜" square mesh and not smaller than No. 20 wire shall be fastened.

(f) The platform, if of wood, shall be made solid of not less than three-inch plank. Platforms complying with 524 CMR 4.01(16)(d) need not be replaced.

(g) Reasonable access to the sheaves and machinery shall be provided above the level of the platform independent of the elevator car. For elevators which conformed to law at the time of original installation, when it is impracticable to reach the platform by an opening above the platform level, a ladder from the top landing to an opening in the platform itself will be permitted; but in this case such means of access is for emergency use only, the normal means of access being from the top of the car.

(17) Supports for Machines and Sheaves.

(a) The beams supporting the machine or overhead sheaves of power elevators shall be of steel. Beams other than steel may be used where permitted by law at the time of original installation. The load to be supported by the elevator machine beams, when the elevator winding machine is directly supported by them and the car-hoisting ropes drop vertically to the car, shall be calculated as not less than the weight of the stationary load, plus the weight of the counterweight and twice the weight of the car and its maximum rated load.

4.01: continued

(b) The load shall be calculated as stated in 524 CMR 4.01(17)(a) when the hoisting ropes lead in a substantially horizontal direction from other supports to leading sheaves over the hoistway.

(c) When the hoisting ropes lead from the elevator machine below in a substantially vertical direction to sheaves over the hoistway, the load to be supported by these overhead sheave beams shall be calculated as the weight of the stationary load resting upon them, plus twice the weight of the counterweights, plus four times the weight of the car and of its maximum rated load.

(d) The worm-gear mechanism and motor of hanger-type elevator machines shall not be located in the hoistway, other than for dumbwaiters.

(18) Car and Counterweight Over-Travel at Top of Hoistway.

(a) Car and counterweight over-travel at top of hoistway of power elevator.

TABLE 1.

Elevators Installed from December 26, 1923 to March 9, 1950

Over Travel (Feet)	Speed, Feet Per Minute From --	To--	Travel Stories	Distance Feet From -- To --	Exceptions
1	--	60	Not over 1	15	Dumb-waiters
2		100	More than 1	50	Dumb-waiters
4	101	350	Any number	Any distance	Dumb-waiters
5	351	450	Any number	Any distance	Plunger elevators and dumb-waiters
6	451	and over	Any number	Any distance	Plunger elevators and dumb-waiters

(b) The minimum over-travel of a hand elevator car and counterweight shall be one foot irrespective of the travel.

(c) Counterweight Stops. There shall be secured at the upper limit of travel of the counterweights of all drum type power elevators an I-beam or other obstruction so that the counterweights cannot be drawn into the overhead sheaves.

4.02: Cars and Car Enclosures

(1) Car Construction.

(a) Power elevator cars shall be constructed with steel suspension frames designed with a minimum factor of safety of at least eight based on the maximum rated carrying capacity plus the weight of the unloaded car. This shall not apply to elevators of the plunger type which are not provided with counterweights; nor to power elevator cars having a lifting capacity of less than 3,000 lbs. or a platform area of less than 40 square feet if the latter was constructed in accordance with law at the time of original installation.

(b) No cast iron shall be used in tension as a suspension member of the suspension frame of any car.

4.02: continued

(c) The car platforms of plunger elevators shall be secured to heads of the plungers. If the plungers are made in more than three sections, the car platforms shall be secured to the bottom heads of the plungers by safety ropes run inside of the plungers or by other methods, but the strength of the joints shall be equal to or greater than the strength of the plungers.

(d) Two cars balancing each other, and operated by the same machine, shall not be used other than for:

1. dumb-waiters and
2. freight elevators serving two floors only, of which all the landing openings are protected by gates or doors equipped with interlocking devices such that the cars cannot be operated unless all the landing gates or doors are closed.

(e) No elevator car, except a dumb-waiter car, shall have more than one compartment, except that elevators installed before June 19, 1914, and having more than one compartment shall be provided with an interlocking device such that either

1. the car cannot be operated from either compartment unless the car door or gate of the other compartment is closed, or
2. the car cannot be operated from either compartment unless all of the landing doors are closed.

(f) Welding of parts upon which depends the safe operation of all equipment contained in 524 CMR shall be done by qualified welders; and all work upon completion shall be approved by the enforcing authority before the elevator, escalator, dumb-waiter, etc. is placed in service. The welders may be qualified by one of the following:

1. by the manufacturer;
2. by a professional consulting engineer;
3. by a recognized testing laboratory.

Exceptions: Tack welds not later incorporated into finished welds carrying calculated loads.

(2) Car Enclosures.

(a) Elevator car enclosures or cages shall be secured to the car platforms and to the suspension slings in such manner that they cannot work loose or be readily displaced.

(b) Passenger elevator cars shall be enclosed on all unused sides and on the top. The enclosures may be of wood or of metal, solid or open work, but if of open work, the design shall be such as will reject a ball two inches in diameter.

(c) No passenger elevator car shall have more than two door openings unless permitted by law at the time of original installation.

(d) Freight elevators including dumbwaiters, platform and sidewalk elevators shall be enclosed full height to car top on all unused sides, or to the crossheads where the crossheads are less than six feet high, and on the counterweight side to the height of the crossheads. The enclosure in front of the counterweight shall be of rigid construction and shall extend not less than one foot beyond the counterweight on each side, where the crossheads are more than six feet above the platform. The enclosures may be wood or metal, solid or open work, but if open work the design shall be such as will reject a ball two inches in diameter.

(e) Where the elevator car enclosure is not solid, other than dumb-waiters, and the openings are larger than ⅜" square, wire netting of not more than ⅜" square mesh and not smaller than No. 20 gauge wire shall cover and be securely attached to the car enclosure on the outside where

1. the counterweight passes with a clearance of less than six inches between the car enclosure and the counterweight, and where
2. there is less than four inches clearance between the car enclosure and any portion of the well construction, other than at the front of the enclosure.

(f) Where the enclosure of a power freight elevator car is cut away at the front of the car to make the shipper ropes accessible, such opening in the enclosure shall be cut low enough to prevent injury to the hand of the operator, and the lower edge of such opening shall be splayed at an angle of not less than 60° with the horizontal.

4.02: continued

(g) Covers shall be installed on freight elevator cars other than

1. hoistway cover elevators, dumb-waiters, and platform elevators;

2. elevators where there are automatically closing gates extending down to the floor on all landings above the lowest landing;

3. elevators with landing doors which open from the well-way side and which are kept closed other than when the car is at the landing, and

4. other than on the ends of freight elevator platforms 12' long or over which there are either no openings above the lowest landing, or where the openings above the lowest landing are protected by automatic-closing gates extending down to the floor. The covers shall be of wire grill-work with a mesh not larger than 1½" x 3" and wire not smaller than No. 9 gauge, or of other construction of equivalent strength and capable of sustaining a load of not less than 150 lbs. per square foot. The covers shall be set back not more than six inches from the edge of the landing thresholds, and shall be hinged on the landing sides at such distance from the edge of the covers, not less than 18" as will permit the cover to fold back readily should it be obstructed in any manner in its descent.

The cover is not required to be hinged at the opening in an outside wall, where there is no other landing opening above on the same side.

(h) There shall be a suitable emergency exit from each passenger elevator car, either by means of a trap door in the cover of the car or, in the case of elevators in battery, by doors opposite each other in the sides of two adjacent cars. All other openings in the car dome shall be closed by hinged covers.

(i) Each passenger elevator for which a licensed operator is required may be provided with a suitable seat for the operator. The seat shall be of the folding type, attached to the side of the car. No other seats will be allowed in passenger elevator cars, other than where there is a fixed seat installed for passengers, or where car is used for carrying an invalid or for hospital purposes.

(3) Passenger Car Gates and Doors.

(a) Passenger elevator cars shall be equipped with a gate or door at each car door opening. Each gate or door shall be equipped with an electric contact to prevent the starting of the car unless the gate or door is in a closed position. Elevator cars, other than dumb-waiter cars, having more than one compartment shall be provided with an electric interlocking device such that the cars cannot be operated unless all the landing gates or doors are closed. Passenger elevator car gates and doors shall, when closed, fill the openings that they protect.

(b) Car doors or gates may be solid or of open work, but shall be of such design as will reject a ball four inches in diameter.

(4) Freight Elevator Car Doors or Gates.

(a) Freight elevators operated by automatic or continuous pressure operation shall have a car door or gate provided at each entrance.

1. Power freight elevators operated by automatic control, continuous pressure control, shipper rope control, hand wheel or lever mechanism shall have a car gate provided at each entrance, and shall be provided with a car door or gate electric contact, or with an interlock.

2. Car gates for freight elevators, when closed, shall guard the full width of the opening and they shall not be less than five feet six inches high.

3. Collapsible gates, when fully expanded, shall reject a ball 4½" in diameter. Vertical lifting type car gates shall be of a design to reject a ball two inches in diameter.

4. A weight used to close automatically or counterbalance a car door or gate shall run in guides from which it cannot readily become dislodged, or it shall be boxed. The bottoms of the guides and boxes shall be so constructed as to retain the weight if the suspension member breaks.

5. Sliding car doors for freight elevators may be solid, may be provided with open grille or bars which will reject a ball two inches in diameter, and may be provided with glass vision panels. Grilles or bars may extend the full height of the door panel.

6. Sliding car doors or gates shall operate in guides.

4.02: continued

7. Hangers for power-operated car doors shall be designed to withstand a downward thrust of five times and an upward thrust of four times the weight of the door.

(b) The open side away from the building wall of a freight elevator car located outside a building shall be protected by a hand-operated or automatic-closing car gate not less than five feet six inches in height.

(c) Automatic-closing freight elevator car gates, not less than five feet six inches in height, adjacent to the outside walls of buildings, or a standard gate equipped with an electric contact may be substituted for the filling-in of setbacks and openings in the outside wall.

(d) The distance from the car sill to the shaftway side of the car door or gate shall not be more than three inches.

(5) Car and Counterweight Safeties and Speed Governors.

(a) Elevators suspended by ropes or chains shall be provided with a safety device attached to the underside of the car sling, and capable of stopping and sustaining the car with its full rated load. Elevators of the four-point suspension type which conformed to the law at the time of original installation need not comply with this provision.

(b) On elevators with rated car speeds up to and including 150' per minute an instantaneous type of safety device may be used for the car. For elevators where the rated car speed is over 150' per minute the car safety device shall be of the sliding type, other than where permitted by law at the time of original installation, and designed to stop the car with its full rated load in not more than eight feet after the governor operates to apply the safety device.

(c) If a counterweight of an elevator does not run to the lowest floor of a building, and the space below its lowest limit of travel is used for any purpose, the counterweight shall be equipped with a safety device which will stop the counterweight if the ropes attached to it break or become slack.

(d) An instantaneous type of safety device may be used for the counterweight for rated car speeds up to and including 150' per minute. For rated car speeds of over 150' per minute the counterweight safety device, where required, shall be of the sliding type.

(e) No car safety device shall be permitted for stopping an ascending car.

(f) Car or counterweight safety devices shall be so constructed that, if applied, they cannot decrease their retarding force until the car has stopped, and so that no decrease in tension of the governor rope or motion of the car or counterweight in the descending direction shall release the safety device.

(g) No safety device which depends on the completion or maintenance of an electric circuit for the application of the safety device shall be used. All safety devices shall be applied mechanically.

(h) The gripping surfaces of car or counterweight safety devices shall not be used to guide the car or counterweight.

(i) A pawl and ratchet or a rack rail type shall not be used as a safety device.

(j) Car safety shoes shall be of steel, and no cast iron shall be used on a car or counterweight as an operating member of a safety device, other than the winding drum of a sliding type safety device or where permitted by law at the time of original installation.

(k) Passenger elevator cars for carrying safes or other concentrated loads greater than the contract load of the elevator shall be provided with a locking device which will hold the car at any landing independent of the hoisting ropes while the safe or other object is being loaded or unloaded.

(l) For power elevators other than dumb-waiters, hoistway cover and plunger type, the car safety device shall be operated by a speed governor if the car travel exceeds 15'. The counterweight safety device, if any, shall be operated by a speed governor if the rated car speed is over 150' per minute.

(m)1. Speed governors for elevators having a rated car speed of 100' per minute or less shall be "set" to cause the application of the car safety device before the speed of the descending car exceeds 175' per minute.

4.02: continued

2. Speed governors for elevators having a rated car speed in excess of 100' per minute and not over 400' per minute shall be "set" to cause the application of the safety device before the speed of the descending car exceeds the average car speed 40%.

3. For elevators having rated car speeds in excess of four hundred feet per minute, the speed governor shall be "set" to cause the application of the car safety device before the speed of the descending car exceeds the average car speed by 33⅓%.

(n) The speed governor shall be located where it cannot be struck by the car or counterweight in case of overtravel.

(o) All speed governors shall be sealed with a wire and lead type seal directly after testing by the authorized inspector conducting the test. No person other than an authorized inspector shall break or remove the seal.

(p) A switch shall be provided on an electric traction elevator to stop the machine on or before the operation of the car safety device.

(q) For hand elevators the car safety device may be operated by the slackening or breaking of the ropes.

4.03: Machines and Machinery

(1) General Design.

(a) Drums and sheaves for power elevators shall be of cast iron or steel, and shall have finished grooves. Drums or sheaves without finished grooves, where permitted by law at the time of original installation, shall be permissible.

(b) Set screw fastenings shall not be used in lieu of keys or pins on elevator machines.

(c) A friction gearing or clutch mechanism which is an integral part of the machine shall not be used to operate the winding drum or sheaves of any elevator, other than in connection with a car-levelling device.

(d) All cast iron worm gearing when changed shall be replaced by bronze worm gearing on all power elevators, other than dumbwaiters.

(e) Gears operating traction sheaves and winding drums when so located as to be dangerous in the opinion of the inspector having jurisdiction, shall be enclosed by suitable guards.

(f) The diameter of driving sheaves and drums for power elevators, other than dumb-waiters, shall not be less than 38 times the diameter of the ropes.

(g) All parts of the installation shall be constructed to permit proper lubrication.

(2) Belt and Chain-Driven Machines.

(a) Single-belt, chain-driven, and multiple V belt type machines are prohibited unless provided with electrically released brakes and terminal stopping devices as required for electric elevators. Belt and chain-driven machines shall not be used for passenger elevators.

Double-belted elevator machines may be changed to operate by chain or V belt drives provided they are equipped with electrically released brakes and terminal stopping devices as required for electric elevators.

Chains for chain-driven machines shall be of the multiple-link belt type.

V belts shall be of the multiple V type.

Chains and V belt drives for machines shall be equipped with guards.

A manually reset type switch shall be provided to stop the elevator machines should one or more of the belts break or should the chain break.

It shall not be permissible to change an elevator machine with a direct-connected motor to a flat belt, V belt or chain drive.

(b) Means shall be provided to stop the driving belts of a double-belted elevator machine without stopping other machinery driven from the same source of power.

(c) Elevator belts, other than within machine enclosures, which come within seven feet of the floor, shall be properly guarded.

4.03: continued

(3) Hydraulic Machines and Tanks. (524 CMR 4.03(3)(a) through (d), 4.03(3)(h), 4.03(3)(k) through 4.03(3)(s), 4.03(3)(v) and 4.03(3)(x) do not apply to elevators installed before the effective date of 524 CMR 10.00.)

(a) The piston rod in tension of hydraulic elevators of the sheave type shall have a minimum factor of safety of eight, figured on the cross-sectional area at bottom threads.

(b) Hydraulic elevator machines, other than dumb-waiters, shall be equipped with piston travel-limit numbers or stops, and shall be constructed of such strength that when the full water pressure is applied the piston will be stopped by this means before the car can be drawn into the overhead work.

(c) Metal guides shall be provided for the sheave suspension yoke of vertical sheave suspension type hydraulic elevators, other than dumb-waiters.

(d) The valve chambers and cylinders of hydraulic elevator machines shall be provided with means of removing air.

(e) The travelling sheaves of vertical cylinder hydraulic elevators shall be attached with two part iron or steel hangers and not with U straps.

(f) The discharge tanks of hydraulic elevators shall be covered to prevent dirt and material falling into them.

(g) Such discharge tanks shall be vented so as to be open to atmospheric pressure.

(h) The pressure tanks for hydraulic elevators shall be built of either flanged or boiler steel or fire-box steel or extra soft steel, or wrought iron, the properties of which shall conform to the requirements of 522 CMR 7.00 (Air Tank Regulations prescribed by the Massachusetts Board of Boiler Rules).

(i) The maximum pressure to be allowed on pressure tanks for hydraulic elevators shall be determined by the formula stated in 522 CMR 7.00.

The factor of safety in the above formula is to be the lowest factor of safety allowed by 524 CMR 4.03(3)(j). The tensile strength used in the above formula shall be the tensile strength stamped on the plates by the manufacturer, or if not so stamped, shall be taken as 45,000 pounds for wrought iron and 55,000 pounds for steel.

(j) The lowest factor of safety to be used for the pressure tanks for hydraulic elevators shall be four, if the longitudinal joints are of butt and double-strap construction. A factor of safety of not less than five shall be used for elevators if the longitudinal joints are of lap construction.

(k) The longitudinal joints of the shell of pressure tanks for hydraulic elevators shall be of butt double-strap construction if the diameter of the shell exceeds 36".

(l) The longitudinal joints of the shell of pressure tanks for hydraulic elevators may be of lap-riveted construction if the diameter of the shell does not exceed 36", but in such cases the maximum pressure to be allowed on the tank shall be 125 lbs. per square inch.

(m) The minimum thickness of shell plates shall be as follows:

TABLE 1

Diameter of Shell	Minimum Thickness of Shell Plate
36" or less	5/16"
Over 36" up to and including 54"	⅜"
Over 54" up to and including 72"	7/16"
Over 72"	9/16"

(n) Openings for threaded connections one inch and over, in pressure tanks for hydraulic elevators, shall be reinforced.

4.03: continued

(o) The minimum thickness of the bumped heads shall be determined in accordance with the formulas for bumped heads in 522 CMR 7.00. The factor of safety in these formulas shall be five, and the tensile strength shall be the tensile strength stamped on the plates by the manufacturer, or, if not so stamped, shall be taken as 45,000 pounds for wrought iron and 55,000 pounds for steel.

(p) When a bumped head has a manhole opening, the thickness as found by the formulas referred to in 524 CMR 4.03(3)(o) shall be increased by not less than ⅛" and the flange shall be turned inward to a depth not less than three times the thickness of the head.

(q) No cast iron heads or flat stayed heads shall be used.

(r) Pressure tanks for hydraulic elevators, if 30" in diameter or less, shall be provided with two 4" x 6" handholes located one in each head or in the shell as near each head as practicable.

(s) Pressure tanks for hydraulic elevators, if over 30" in diameter, shall be provided with an 11" x 15" manhole.

(t) Every pressure tank for hydraulic elevators shall have a pressure gage connected to the tank by a brass or other non-corrosive pipe, and in such manner that the pressure gage cannot be shut off from the tank, other than by a cock with a T or lever handle placed on the pipe near the pressure gage. The dial of the pressure gage shall be graduated to not less than 1½ times the maximum pressure allowed on the tank.

(u) Every tank for hydraulic elevators shall be provided with a ¼" pipe size connection for attaching inspector's test gage when the tank is in service, so that the accuracy of the pressure gage can be ascertained.

(v) Pressure tanks for hydraulic elevators shall be tested before being put in use with hydrostatic pressure 50% in excess of the maximum working pressure for which the tank is constructed. The hydrostatic test may be made in the shop of the manufacturer.

(w) Pressure tanks for hydraulic elevators shall be provided with water gage glasses, connected with brass pipe and fittings and indicating the height of the water in the tank.

(The water level in the tank should generally be maintained at about ⅔ of the height of the tank.)

(x) Pressure tanks for hydraulic elevators shall be so located and supported they can be inspected on all sides and ends.

(4) Pumps and Pump Regulators.

(a) Every pump connected with the pressure tank of an hydraulic elevator shall be equipped with a water-relief valve or valves.

(b) The size of the relief valve shall be not less than the following, except that two or more valves may be used to give the required area:

TABLE 2.

Diameter of Discharge Opening of Pump	Size of Relief Valve
2" or less	1"
2½"	1¼"
3"	1½"
3½"	2"
4"	2"
4½"	2½"
5"	2½"
6"	3"
7"	3"
8"	3"
9"	3½"
10"	4"
12"	4"
14" O.D.	5"
15" O.D.	5"
16" O.D.	5"

4.03: continued

(c) The valves shall be set to discharge at a pressure not greater than the safe working pressure for the tank, and shall be installed so that they cannot be shut off from the pump.

(d) The relief valves may be piped to discharge into the discharge tank or into the pump suction.

(e) Steam pumps for hydraulic elevators shall be provided and operated with pressure regulating valves controlling the steam to the pumps, and electric-driven pumps for hydraulic elevators shall be equipped with automatic pressure regulating valves controlling the motor, or with automatic by-passes.

(f) When liquid in excess of two gallons per month is added to the tank of a hydraulic elevator or dumb-waiter where the driving machine is of the direct plunger type, the following rules shall be fully complied with:

1. A log shall be posted in the pump room on the liquid tank in full view of a person instructed to add liquid.
2. The log shall read as follows:

Amount of liquid added in gallons.
Date when liquid was added.
Full name of person adding liquid to the hydraulic tank.

A letter shall be mailed immediately to the authorized inspector having jurisdiction and a copy of the letter mailed to the Elevator Section, Department of Public Safety, McCormack Building, One Ashburton Place, Boston, MA 02108, reporting the date and amount of liquid added.

(5) Hand Elevator Machines.

(a) Hand elevators shall be equipped with a brake that operates to stop the machine in either direction. When the brake has been applied, it shall remain locked in one position until released.

(b) No hand elevator machine shall be equipped with any means or attachment for applying any other power, unless such elevator is permanently and completely converted into a power elevator complying with all the requirements for power elevators.

(c) Power shall not be applied to hand elevators by means of rope grip attachments or clutch mechanisms.

(d) The minimum carrying capacity of hand passenger elevators shall be 50 lbs. per square foot of platform area inside of the car enclosure.

(6) Electric Brakes.

(a) Electric brakes shall be installed on power elevators (direct connected, chain driven, and multiple V belt driven).

(b) Every direct current elevator controller operating a brake magnet shall provide a means for handling the shunt winding of the brake magnet in such a way that the brake will not be retarded in its action by motor field discharge.

(7) Enclosures Around Machines.

(a) Elevator machines located on the floor shall be enclosed by solid partitions or grille-work not less than four feet high. The mesh or grille-work shall be such as to reject a ball two inches in diameter.

(If the elevator machine is located in an engine room or pump room, etc., used exclusively as such, the enclosures are not required, but such protection as is required for fly-wheels, belted apparatus and other machinery shall be provided.)

(b) Partitions or grille-work enclosing machines shall be kept clear to avoid any material from falling into the area occupied by the elevator machine. Partitions, guards and head room around elevator machines shall be so located as to make all parts of the machines properly accessible for inspection and care.

(c) The entrance door or gates to elevator machine rooms and machine enclosure shall be kept locked.

4.04: Ropes

(1) Hoisting and Governor Ropes.

(a) Car and counterweight hoisting ropes, other than for dumb-waiters, shall be of iron or steel without covering, except that Marlin covered ropes may be used where liability to excessive corrosion or other hazard exists.

(b) The minimum factor of safety based on static loads for car and counterweight ropes for power elevators, other than dumb-waiters, shall be not less than the values given in Figure 1 in 524 CMR 4.04, corresponding to the rated car speed.

The number and diameter of the ropes for elevators, other than dumb-waiters, shall be determined by using the factor of safety given in Figure 1 in 524 CMR 4.04, together with the ultimate strength of the rope. The computed load on the ropes shall be the weight of the car plus its rated load, plus the weight of the hoisting ropes and compensations, if any. For power elevators, other than dumb-waiters, ropes having a diameter of less than ⅜" shall not be used unless permitted by law at the time of the original installation. The minimum factor of safety of all car and counterweight hoisting ropes for hand elevators shall be five based on the suspended load.

(c) The minimum factor of safety of car and counterweight hoisting ropes for elevators, other than those of dumb-waiters, and other than where permitted by law at the time of original installation, shall be six based on the suspended load. The ultimate strength of the ropes shall be based on the rope manufacturer's lists.

(d) Elevator cars and counterweights shall have not less than two hoisting ropes each, other than on dumb-waiters, hand freight elevators having a lifting capacity of 500 lbs. or less, the counterweights of freight elevators where the counterweight does not weigh more than 1400 lbs., the counterweights of elevators where there is only one existing rope, freight elevator cars installed where there is only one existing rope, and other than where permitted by law at the time of original installation.

(e) Power traction machines, other than dumb-waiters or where permitted by law at the time of original installation, shall have not less than four ropes if the rated capacity exceeds 1,000 lbs., and not less than three ropes if the rated capacity is 1,000 lbs. or less.

(f) No car or counterweight rope, whether new or used, shall be extended or repaired by splicing another piece of rope to it.

(g) For winding drum-type machines, there shall be not less than one full turn of each car-hoisting rope on the drum when the car has reached the lower limit of travel, and not less than one full turn of each counterweight-hoisting rope on the drum when the counterweight has reached its lower limit of travel.

(h) The drum ends of the car and counterweight-hoisting ropes shall be secured by clamps or by tapered sockets.

(i) The car and counterweight ends of ropes shall be fastened by spliced eyes, by return loop, or by individual tapered babbitted sockets. Such fastenings are not required for dumb-waiters or for the compensating counterweight ropes of plunger elevators. The length of socket shall be not less than four times the diameter of the rope. The hole at the small end of the socket shall be not more than 1/16" larger than the diameter of the rope. After passing through the socket the strands shall be separated and turned into the center, the length of the turned-in portion being not less than two and one-half times the diameter of the rope. The knot shall be drawn tightly into the socket and poured with zinc or babbitt. The socket shall be dropped forged or steel casting, not cast iron, and shall be of sufficient strength to break the rope before the socket gives any indication of distress.

Where hoist and counterweight ropes are replaced, adjustable individual tapered babbitted sockets shall replace non-adjustable babbitted sockets, where practicable.

(j) Equalizers shall be installed at connections to cars of hoisting ropes on elevators, other than dumb-waiters, and other than where permitted by law at the time of original installation.

Rope equalizers shall be provided at the car ends of overhead winding drum type machines, other than dumb-waiters, if the ropes wind in right and left hand grooves on the drum.

Rope equalizers or self-adjusting rope-hitches shall be provided at the car or counterweight ends of all hoisting ropes for traction-type elevators, other than dumb-waiters. Equalizers may be of the compression spring type for traction elevators.

4.04: continued

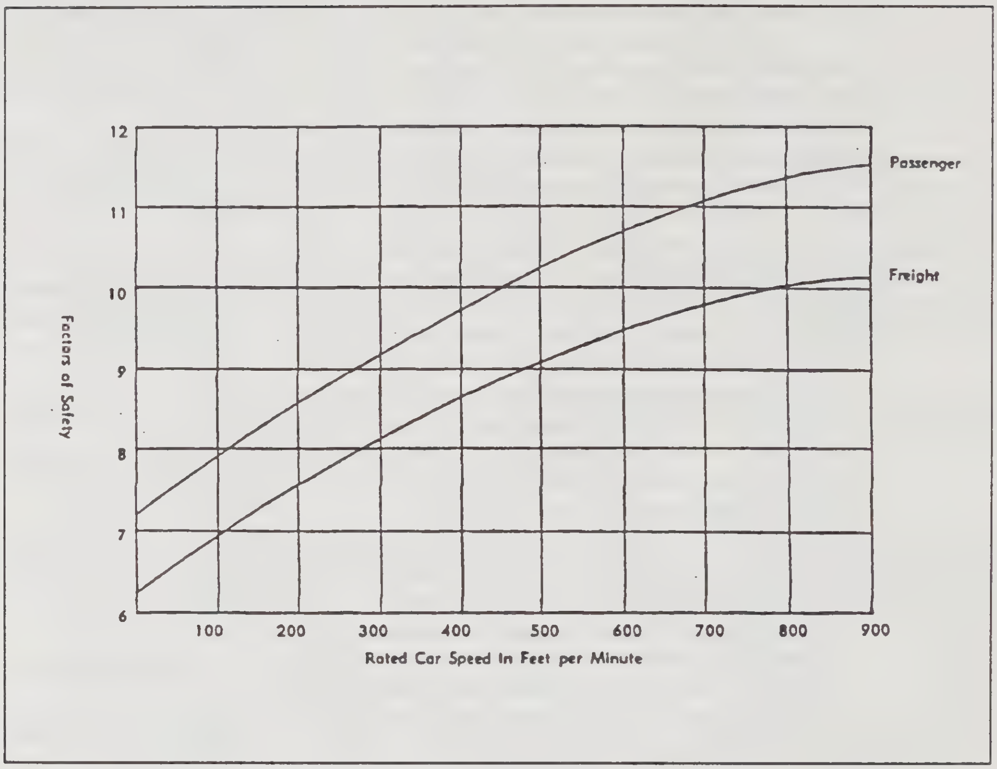
(k) Car counterweight ropes shall be fastened independent of hoist rope fastener.
(l) On horizontal hydraulic machines there shall be at least ten feet between anchorage and sheaves. If this cannot be obtained, rope ends shall be secured with unleaded knots.
(m) The car and counterweight ropes shall be installed in such a manner that the car and counterweight shall respectively be brought to rest on buffers before the counterweight or car strikes any part of the overhead structure.
(n) Governor ropes for elevators shall be of uncovered steel, iron or monel metal not less than ⅜" in diameter. Governor ropes shall not be of tiller rope construction.
(o) Tail ropes shall be of corrosive-resistant metals. Sheradized or galvanized iron or steel rope shall not be used as a tail rope.
(p) Auxiliary rope-fastening devices, designed to support elevator cars or counterweights if any regular rope fastening fails, may be provided subject to the following requirements:
(q) Periodic Resocketing of Babbitted Rope Sockets of Car Hoisting Ropes on Winding-Drum Driving Machines. Requirements for same shall be as specified in 524 CMR 17.26(19).

1. They shall be approved by the enforcing authority on the basis of adequate tensile and fatigue tests made by a competent designated laboratory.
2. The device and its fastenings, in its several parts and assembly, shall have a strength at least equal to that of the manufacturer's breaking strength of the rope to which it is to be attached.
3. Steel parts used in the device shall be cast or forged with an elongation of not less than 20%, conforming to ASTM Specifications A235-63T, Class C for forgings and A27-62, Grade 60/30 for cast steel, and shall be stress relieved.
4. The device shall be so designed and installed that:
   It will not become operative unless there is a failure of the normal rope fastening.
   It will function in a rope movement of not over 1½".
   It will not interfere with the vertical or rotational movements of the rope during normal service.

(2) Shipper Ropes, Rope Locks and Controlling Devices.
(a) No elevator traveling at a rated car speed exceeding 100' per minute shall be controlled by a hand-operated shipping rope, other than where permitted by law at the time of original installation.
(b) No elevator traveling at a rated car speed exceeding 150' per minute, other than an hydraulic elevator, shall be controlled by shipping rope operated by wheel or level mechanism, other than where permitted by law at the time of original installation.
(c) The overhead tension weights of shipping ropes shall be equipped with safety chains of not less than No. 7 wire gauge, securely fastened to the weight and to anchorage.
(d) Shipper ropes shall be so located as to be inaccessible from the landings.
(e) Shipper ropes on electric elevators shall be grounded.
(f) Freight elevators controlled by shipper ropes, other than dumb-waiters, shall be provided with shipper rope locks, so arranged that the cars can be locked at each landing.
(g) Electric power elevators equipped with electric brakes, other than dumb-waiters, controlled by hand-operated shipping ropes, shall have the controlling device so arranged that, in case of failure of power, it will be necessary to return the controlling device to the off position before the elevator can be started again.
(h) Freight elevators controlled by shipper ropes, other than dumb-waiters, shall be provided, where practicable, with centering ropes to stop the cars at any part of their travel. The centering ropes shall be attached to the shipper ropes directly under the upper sheaves.
(i) No electrically released, gravity or spring applied rope gripper or rope lock shall be used as a component device in any interlocking system.

4.04: continued

FIGURE 1



4.05: Counterweights, Guide Rails and Buffers

(1) Counterweight Construction. Counterweights shall have their sections securely bolted or strapped together to keep the individual or subweights in position. Rods passing through the counterweights shall be provided with double nuts, and the ends of the rods, outside of nuts, shall be riveted over or provided with cotter pins. Car counterweights, when provided, shall be suspended above the machine or drum counterweight.

(2) Car and Counterweight Guide Rails.
(a) Counterweights of power elevators shall run in guide rails, unless otherwise permitted by law at the time of original installation.
(b) For elevators, other than dumb-waiters, having rated car speeds exceeding 100' per minute, car and counterweight guide rails shall be of steel, unless otherwise permitted by law at the time of original installation. When the use of steel rails presents an accident hazard, as in chemical or explosive factories, wood guide rails may be used.
(c) The weight of steel guide rails shall not be less than given in the following table:

4.05: continued

TABLE 1.

Total Weight of Car and Load. Total Weight of Counterweights Per Pair of Rails (Pounds)		Minimum Weight of Each Car Guide Rail (Pounds Per Linear Foot)	Minimum Weight of Each Counterweight Guide Rail (Pounds Per Lineal Foot)		
Above	To and Including		With Guide Rail Safeties	Without Guide Rail Safeties	
				Roping 2 to 1	Roping 1 to 1
--	4,000	6½	6½	6½	6½
4,000	6,000	11	6½	6½	6½
6,000	15,000	14	14	6½	6½
15,000	40,000	30	30	14	14

(d) Steel guide rails shall be tongued and grooved and secured with plates at joints, or the joints otherwise equally secured so as to be free from motion in any direction.

(e) The size of wooden car-guide rails, other than for dumb-waiters, shall not be less than given in the following table, or as otherwise permitted by law at the time of original installation:

TABLE 2

Total Weight of Car and Load Per Pair of Maple Guide Rails (Pounds)		Size of Each Guide Strip in Inches
Above--	To and including--	
	5,000	2 x 2½
5,000	8,000	2½ x 3
8,000	12,000	3 x 4
12,000	16,000	4 x 5

(f) Guide strips of wooden car guide rails shall be made of maple and shall be securely mounted on substantial posts. Existing guide strips of suitable hard wood need not be changed.

(g) Guide rails for cars and counterweights shall extend to the bottom of the pit and to the overhead beams, and shall be strongly fastened in place.

(h) Steel guide rails shall be securely fastened with iron or steel brackets of such strength, design and spacing that the guide rails and their fastenings will not deflect unduly under normal operation or when the safety operates to stop the fully loaded car or counterweight. Steel guide rails and their fastenings shall be secured in position by clips or through bolts of not less than the following sizes:

6½ pound rails, ½" bolts
11 and 14 pound rails, ⅝" bolts
30 pound rails,¾" bolts

(i) The size of wooden car guide rails for hand elevators having a capacity not exceeding 3,000 lbs., other than dumb-waiters, shall be not less than 1¾" across the gripping face, and not less than 1¼" thick.

(j) Cast iron guide rails shall not be used for elevator or counterweights.

4.05: continued

(3) Buffers.

(a) Car buffers shall be installed in elevator pits so as to leave a clear space of not less than 12" between the floor of the pit and the under side of the car sling when the elevator car rests on the buffers, unless otherwise permitted by law at the time of original installation.

(b) Spring buffers or their equivalent shall be used for elevators having a rated car speed of more than 100' and not exceeding 400' per minute, unless otherwise permitted by law at the time of original installation.

Oil buffers or their equivalent shall be used with elevators having a rated car speed greater than 400' per minute.

(c) Buffers shall be located symmetrically with reference to the vertical center of the car frame or the counterweight frame within a tolerance of two inches unless otherwise permitted by law at the time of original installation.

(d) Adequate provision in the design of plunger elevators shall be made to stop the plunger as well as the car.

(e) Counterweight bumpers or buffers similar to those required for cars shall be installed under the counterweights of elevators, and for elevators which do not run to the lowest floor of the building when the space below their lowest limit of travel is used for any purpose.

(f) Oil buffers, or their equivalent, for an elevator, the rated car speed of which exceeds 400' per minute, shall be of such design and construction as to absorb, within the limits of the moving parts of the buffers, all the energy of the counterweight or car loaded to its full capacity, descending at governor tripping speed.

4.06: Controlling Devices and Terminal Stops

(1) Machine Slack Rope Safety Devices.

(a) Slack rope devices which will stop the elevator machines if the hoisting ropes slacken or break, shall be provided on winding drum power elevators having a travel of over 15', other than dumb-waiters and platform elevators subject to 524 CMR 4.06(1)(c).

(b) In the case of selective automatic button control elevators, the slack rope safety device shall break the car stop-button circuit.

(c) Slack rope devices which will stop the elevator machines if the hoisting ropes slacken or break, shall be provided on winding drum power dumb-waiters having a travel of over 30' and a capacity of over 100 lbs., and serving more than two landings.

(d) Machine slack rope switches shall be so constructed that they will not automatically reset when the slack in the rope is removed.

(e) An emergency stop switch shall be installed in the pit and on the top of every electric elevator, electric hydraulic elevator, and every hydraulic elevator equipped with an electrically operated valve. The switch on the car top shall be located near the center of the car crosshead facing the front of the car.

(2) Terminal Stops. (524 CMR 4.06(2)(b) to 4.06(2)(h), inclusive, do not apply to dumb-waiters.)

(a) Power elevators, other than traction elevators, and other than plunger elevators having a travel of 30' or less or having a speed of less than 150' per minute, shall be equipped with adjustable machine automatic terminal stop mechanisms set to stop the machines before the cars or counterweights pass 18" above their upper limits of normal travel, or before they pass more than ½ the over-travel space when this space is less than three feet.

Automatic stop valves on hydraulic machines are included as machine automatic terminal stop mechanisms, and must be arranged to allow the machine to always start the car away from the terminal landings at normal speed.

(b) No chain or rope-driven machine automatic terminal stop mechanisms on winding drum type machines shall be allowed, unless permitted by law at the time of original installation. A chain or rope-driven elevator machine automatic terminal stop mechanism may be used as a secondary safety device if the machine automatic terminal stop mechanism has been lawfully installed and kept in proper condition and adjustment.

4.06: continued

(c) Traction type electric power elevators of the car switch or button control type shall be equipped with car or hoistway limit switches operated directly by the car, and connected to automatically slow down and stop the car:

1. before it passes 18" above the top terminal landing, or before it passes more than one-half the overtravel space when this space is less than three feet, and
2. not less than two inches before the car strikes the buffers in the pit.

Where car and counterweight oil buffers are provided, the limit switches may be arranged to stop the car two inches before the car and counterweight buffers are fully compressed.

A final stop hoistway limit switch shall be installed at the top and bottom of the hoistway, operated directly by the car if it passes beyond the limits of travel specified above, and connected to open the circuit of either:

1. a main line circuit switch on the controller, independent of the car control switch or button or:
2. two or more solenoid switches controlled by the car control switch or button, two of which must be closed to complete the motor circuit in each direction of travel, provided this limit switch is connected into the control circuit on the opposite side of the magnet winding from the car control switch or button.

Traction type electric power elevators having shipper rope control shall be equipped with final stop car or hoistway limit switches at the top and bottom of the hoistway operated directly by the car, and connected to open the circuit of a main line circuit switch if the car passes more than 18" above the top terminal landing, or if it passes more than ½ the overtravel space when this space is less than three feet and not less than two inches before the car strikes the buffers in the pit.

(d) All winding drum type electric elevators of the car switch or button-control type shall be equipped with hoistway limit switches operated directly by the car, and connected to automatically slow down and stop the car:

1. before it passes 18" above the top terminal landing or before it passes more than ½ the overtravel space when this space is less than three feet, and
2. not less than two inches before the car strikes the buffers in the pit.

Final stop hoistway limit switches shall be installed at the top of the hoistway operated directly by the car and counterweight and at the bottom of the hoistway operated directly by the car and arranged to stop the machine

1. if the cars or counterweights pass 18" above the upper limits of normal travel, or before it passes more than ½ the overtravel space when this space is less than three feet.
2. before the car strikes the buffers in the pit.

The final stop hoistway limit switches and the machine automatic terminal stop mechanism shall be connected to open the circuit of either

1. a main line circuit switch on the controller independent of the car control switch or button, or
2. two or more solenoid switches controlled by the car control switch or button, two of which must be closed to complete the motor circuit in each direction of travel provided they are connected into the control circuit on the opposite side of the magnet winding from the car control switch or button.

(e) Winding drum type machines of the car switch or button-control type shall either have terminal stops arranged as called for in 524 CMR 4.06(1)(a) and 4.06(1)(d) above, or they shall have the automatic terminal stop mechanism arranged to slow down and stop the machine before the cars or counterweights pass 18" above the upper limits of normal travel, or before they pass more than ½ the overtravel space when this space is less than three feet provided they are also equipped with final stop hoistway limit switches operated respectively by the car and counterweights as they pass their upper limits of normal travel and arranged to stop the machines if the cars and counterweights pass 18" above the upper limits of normal travel, or before they pass more than ½ the overtravel space when this space is less than three feet.

4.06: continued

A hoistway limit switch may control, together with the car control switch or button, a single solenoid in the armature circuit only if the armature and brake circuits are positively opened by the machine automatic terminal stop mechanism. A hoistway limit switch may control together with the car-control switch or car-control button, two or more solenoid switches, two of which must be closed to complete the armature circuit in each direction of travel. Where a hoistway limit switch controls the same solenoid switch or solenoid switches as the car-control switch or car-control button, it shall be connected into the control circuit on the opposite side of the magnet windings from the car-control switch or car-control button.

(f) Winding drum type electric elevators operated by two or three phase alternating current shall have the machine automatic terminal stop mechanism arranged to directly open the main line circuit to the motor and brake if the car or counterweights pass 18" above their upper limits of normal travel or before they pass more than one-half the overtravel space when this space is less than three feet.

(g) Direct current winding drum type electric elevators having shipper rope control, and all alternating current winding drum type electric power elevators having shipper rope control, shall be equipped with final stop hoistway limit switches operated directly by the car and counterweight and connected to open the circuit of a main line circuit switch if the car or counterweights pass 18" above the upper limits of normal travel or before they pass more than ½ the overtravel space if this space is less than three feet.

(h) Electric elevators operated by polyphase alternating current motors shall be provided with relays of the potential type which will prevent the starting of the motor if

1. the phase rotation is in the wrong direction, or
2. there is a failure of any phase.

(i) Elevators having shipper rope control shall be equipped with adjustable ball stops, adjusted to stop the cars within six inches of the upper and lower landings.

(j) Hoistway and car limit switches shall be enclosed and shall be of heavy design and construction securely mounted in such a manner that the movement of the switch roller to open the contacts shall be in a direction as nearly as possible at right angles to a line drawn between the face of the car rails. The cam or cams for opening the limit switches shall be of iron or steel securely fastened so that they cannot move out of place.

(k) The main line circuit switch referred to in 524 CMR 4.06(2)(c), 4.06(2)(d) and 4.06(2)(g) shall be of the multi-pole type when two or three phase alternating current is used.

(3) Electric Car Switches.

(a) Electric car control switches shall be so constructed as to return automatically to their off position upon the removal of the hand of the operator, and shall lock automatically in the "off" position.

(b) Levers of operating devices for car switch operation elevators shall be so arranged that the movement of the lever toward the car gate which the operator usually faces will cause the car to descend and the movement of the lever away from the gate will cause the car to ascend. The direction of travel shall be indicated on the car switch.

(4) Emergency Switches.

(a) An emergency switch or stop button shall be installed in every elevator car of every electric elevator, electric hydraulic elevator, and every hydraulic elevator equipped with an electrically operated valve. An emergency switch shall not be required on elevators equipped with hoistway covers or mechanical brakes. An emergency switch shall be installed in the pit of all elevators equipped with hoistway covers and an electric brake. The switch in the car top shall be located vertically near the center of the car crosshead facing the front of the car. The switch in the pit shall be located vertically not more than six inches below the top of the pit, and not to exceed two feet from the face of the landing opening in full view of the landing near the front of the car. When access to the pit is by means of an access door, this switch shall be so located as to be accessible from the pit access door. Where access to the pits of elevators in a multiple hoistway is by means of a single access door, the stop switch for each elevator shall be located adjacent to the nearest point of access to its pit from the access door.

4.06: continued

(b) Such emergency switch or "stop-button" shall be connected to open the circuit of a main line circuit switch independent of the car-control device and shall be connected by an electric cable independent of the car-control cable and of opposite polarity.

(c) Such emergency switches shall be provided with a red metal plate marked, "EMERGENCY", permanently and securely fixed to the front of the switch. The height of the lettering shall be not less than ¼".

(d) Emergency stop switches may be operated by buttons or levers, but shall be of the manually opened and closed type and so installed that when opened gravity will not tend to close the switch.

(5) Overload Circuit Breakers. If an overload circuit breaking device is used for an electric elevator operated by direct current, it must be arranged to open the circuit of the brake magnet coil winding at the same time that the line circuit is opened.

(6) Grounding Machine Frames. The frames of electric elevator machines shall be grounded.

(7) Voltage of Control Circuit and Fuse Substitution.

(a) No difference of potential in excess of 250 volts shall be permitted in any car-switch or button-control circuit.

(b) No wire or other current carrying device shall be substituted for the proper fuse or circuit breakers in an elevator circuit.

(8) Switchboards, Panel Boards, and Contact Supports. Switchboards, panel boards, and contact supports shall be of moisture-resistant and non-combustible material.

4.07: Miscellaneous

(1) Material Changes. Before a material change, as defined in 524 CMR 15.00 through 33.00, is made with respect to an elevator, the person making such change shall give notice thereof, in writing, to the department having jurisdiction, and shall comply with the provisions of said 524 CMR 15.00 through 33.00.

(2) Capacity and Speed.

(a) The minimum carrying capacity of a power passenger elevator shall be 75 lbs. per square foot of car platform area inside of the car enclosure, other than a hospital elevator arranged to carry a cot or stretcher, and other than a private residence elevator, in which cases the minimum carrying capacity shall be 50 lbs. per square foot of car platform area inside of the car enclosure.

(Hospital elevators of the direct-plunger type need not have a capacity exceeding 1,000 lbs., even if the size of the car is such as to require a greater capacity on the basis of 50 lbs. or 75 lbs. per square foot.)

(b) There shall be a metal capacity plate located in a conspicuous place in each elevator and dumb-waiter car, on which plate shall be the word "Capacity" in letters not less than ¼" high, followed by figures and letters not less than ¼" high designating the normal rated lifting capacity of the elevator in pounds.

(c) The rated speed of any elevator shall not exceed 600' per minute, other than that express elevators may be run at a rated speed not exceeding 700' per minute for that portion of the shaft in which no landing stops are made. Express elevators shall mean only such elevators as run 80' or more without a stop.

(d) The speed of platform elevators and of hoistway cover elevators shall not exceed 55' per minute, other than where permitted by law at the time of original installation.

(e) The minimum carrying capacity of hand passenger elevators shall be 50 lbs. per square foot of platform area inside of the car enclosure.

(f) Freight handlers, employees and emergency loading of freight elevators.

4.07: continued

1. Freight elevator cars may be used at any time by the minimum number of persons required for accompanying and handling the freight.
2. It shall be allowable at stated hours to carry employees on a freight elevator, equal in number to the contract load divided by 150.
3. It shall be allowable to carry passengers on a freight elevator under emergency conditions, equal in number to the contract load divided by 150.

Provided that in 524 CMR 4.07(2)(f)2. and 4.07(2)(f)3. there is a licensed operator and provided that the elevator conforms in all respects to the requirements of this code for passenger elevators other than as to platform area.

(3) Lighting.

(a) Every passenger elevator car, when in use, shall be adequately lighted by an electric light in the car. Light bulbs, globes and fixtures shall be so protected as to prevent them from falling.

(b) Every freight elevator car, when in use, other than cars of hoistway cover elevators and dumb-waiters, shall be adequately lighted by electricity. Lights may be located in or adjacent to the hoistways if they light the car properly throughout its entire travel, or the light may be located in the car.

(c) There shall be electric lighting at each story near hoistway cover and platform elevators, so arranged as to illuminate the car and its approaches adequately. If there is a solid enclosure around the elevator, sufficient lights shall be located inside of the hoistway.

(d) Every elevator machine room shall be provided with a suitable electric light which can be lighted without passing over or reaching over any part of the machinery.

(4) Signals.

(a) An annunciator or other signal system, operated from each landing and indicating from which landing the call originates, shall be installed in every passenger elevator car other than in private residence elevator cars, continuous pressure operation, automatic operation type elevators, elevators arranged to stop automatically at the floor landings, and passenger elevators making regularly scheduled stops.

(b) There shall be a bell or gong located in every power freight elevator or in the hoistway audible on all floors, and arranged to be operated from each landing opening. The provisions of this subdivision do not apply to dumb-waiters, to elevators serving only two adjacent stories, nor to elevators equipped with an annunciator or other signal system such as required in 524 CMR 4.07(4)(a).

(c) Every hoistway elevator car shall be equipped with a gong which shall ring at least twice as the car passes through each story. The gong shall be plainly audible above the street noises and noises due to machinery or work in the building.

(d) Every automatic push-button elevator shall be provided with an emergency call bell operated from the car and audible outside the hoistway.

REGULATORY AUTHORITY

524 CMR 4.00: M.G.L. c. 143, § 69.

524 CMR 5.00: SIDEWALK ELEVATORS INSTALLED BEFORE MARCH 9, 1950

Section

5.00: Sidewalk Elevators

5.00: Sidewalk Elevators

(1) Protection of Openings. The opening of a sidewalk elevator landing within the line of any sidewalk or passageway open to the public, shall be protected by substantial guards before the elevator is started, the lower rail of which shall not be less than 18" high, and the upper rail not less than 30" high. These guards shall be securely held in place when the elevator is in use.

(2) Hoistway Covers.

(a) If the hoistway is located outside of the building or in a passageway open to the public, it shall be provided with a lifting cover of the automatic self-closing type operated by substantial brackets not less than six feet high, placed on the elevator platform.

(b) Hoistway covers of sidewalk elevators shall be of sufficient strength to safely carry a uniformly distributed live load to 250 lbs. per square foot, or a concentrated load of 8,000 lbs., whichever load gives the higher stresses.

(c) Vertical lifting hoistway covers shall not be used as a thoroughfare or passage unless there is a clear space above the cover, when at the top of its travel, of not less than two feet.

(3) Hoistway Enclosures and Gates.

(a) If the hoistway is located outside the building and the elevator serves only one story below the street level, the lower story shall be enclosed on the unused sides with guards not less than three feet four inches above the floor, securely fastened in place.

(b) The landing openings in the enclosures or guards around the hoistway at the bottom landing of a sidewalk elevator serving only two adjacent stories, shall be protected by a hand-operated bar, gate or chain, if an automatic gate is not installed.

(c) If the hoistway serves more than one story below the street, the hoistway enclosure and landing gates shall be the same as required for freight elevators.

(4) Clearance Between Cover Frame and Platform. The clearance between the sidewalk cover frame and the elevator platform shall not exceed two inches, unless otherwise permitted by law at the time of original installation.

(5) Guards Around Machinery.

(a) Suitable guards not less than four feet high shall be placed around the machinery of power elevators.

(b) Gears, operating winding drums or sheaves of sidewalk type elevators so located as to be dangerous shall be enclosed by suitable guards.

(c) Partitions, guards and head room around sidewalk elevator machines shall be so located as to make all parts of the machines properly accessible for inspection and care.

(6) Hoist Ropes.

(a) Hoisting ropes or chains for sidewalk elevators shall be of iron or steel, and shall have a factor of safety of six based on the suspended load.

(b) There shall be not less than one full turn of each hoisting rope on the winding drum of a sidewalk elevator when the car is at the lowest limit of travel.

(c) The drum ends of the hoist ropes or chains shall be secured by clamps or tapered sockets.

(d) The car ends of hoist ropes shall be fastened by spliced eye or tapered sockets. Car ends of hoist chains shall be fastened by "U" bolts provided with lock nuts and cotter pins or other suitable fastenings.

5.00: continued

(7) Operating Ropes.

(a) Shipper ropes or chains shall be so located as to be inaccessible from street opening or landing opening in outside wall of building when elevator is not at the sidewalk level.

(b) Shipper ropes or chains of electric sidewalk elevators shall be grounded.

(8) Guide Rails. Car guide rails for power sidewalk elevators shall be of steel, and shall weigh not less than seven pounds per lineal foot. They shall be securely fastened with iron or steel brackets, and shall be tongued and grooved or dowelled, and secured with plates at joints or the joints otherwise equally secured so as to be free from motion in any direction, unless otherwise permitted by law at the time of original installation.

(9) Terminal Stops.

(a) Power driven sidewalk elevators, other than plunger type and traction type, shall be equipped with adjustable machine automatic terminal stop mechanisms, set to stop the machinery at the upper and lower limits of normal travel. No chain or rope driven machine automatic terminal stop mechanism on winding drum type machines shall be allowed, other than where permitted by law at the time of original installation.

(b) Elevators having shipper rope control shall be equipped with adjustable ball stops, adjusted to stop the cars within six inches of the upper and lower landings.

(10) Reverse Phase Relay and Main Line Circuit Switch.

(a) Electric sidewalk elevators operated by polyphase alternating current motors shall be provided with relays of the potential type which will not permit the starting of the motor if

1. the phase rotation is in the wrong direction or,
2. when there is a failure of any phase.

(b) Electric sidewalk elevators shall be provided with a main line circuit switch.

(11) Electric Brakes. Electric sidewalk elevators shall be provided with electric brakes. Other type brakes permitted by law at the time of original installation need not be changed.

(12) Pits and Bumpers.

(a) Where elevator pits are provided they shall be maintained at the depth permitted by law at the time of the original installation.

(b) Where car bumpers were required by law at the time of the original installation they shall be maintained without any change in the height or construction.

(13) Speed. The speed of power sidewalk elevators shall not exceed the speed permitted by law at the time of the original installation.

(14) Lighting.

(a) There shall be electric lighting at each story of a sidewalk elevator, arranged to illuminate the car and its approaches properly. If there is a tight enclosure around the elevator, sufficient light shall be located inside of the hoistway.

(b) Every elevator machine room shall be provided with a suitable electric light which can be lighted without passing over or reaching over any part of the machinery.

REGULATORY AUTHORITY

524 CMR 5.00: M.G.L. c. 143, § 69.

524 CMR 6.00: MOVING STAIRWAY (ESCALATOR) INSTALLATIONS

Section

6.00: Moving Stairway (Escalator) Installations

6.00: Moving Stairway (Escalator) Installations

(1) Drive. Each moving stairway shall be driven by an independent electric motor unless otherwise permitted by law at the time of original installation.

(2) Speed. The speed of a moving stairway shall not exceed 100' per minute. Where higher speeds were permitted by law at the time of original installation of the moving stairway the speed need not be reduced; but in no case shall the speed of an existing moving stairway be increased over its present speed.

(3) Electric Brake. Each moving stairway machine drive shall be provided with an electrically released, mechanically applied brake, which shall stop the moving stairway automatically when the power is cut off.

(4) Emergency Stops. There shall be a button or other type of switch, located in a conspicuous position at the top and bottom of each moving stairway. The operation of the button or switch shall cause the opening of the line circuit, stopping the motor and applying the brake. Each button or switch shall be plainly marked "Moving Stairway Stop Button", "Moving Stairway Stop Switch", "Escalator Stop Button" or "Escalator Stop Switch", as the case may be. It shall be impossible to start a moving stairway from these switches.

(5) Starting Buttons or Switches. Where starting buttons or switches are accessible to the public, they shall be either of the key operated type, or shall be enclosed in a box provided with a lock and key.

(6) Safety Devices.

(a) Moving stairways shall be so constructed that if the tread chain or chains should break, the treads will not be displaced from their guides.

(b) Moving stairways, when operating in the ascending direction, shall be equipped with a safety device which shall open the power circuit, apply the machine brake, and stop the moving stairway in case of accidental reversal; other than those operated by rack type links originally installed without such safety devices.

(c) Descending moving stairways shall be provided with a safety device which shall open the power circuit, apply the machine brake and gradually stop the moving stairway in case the moving stairway overspeeds 40%.

(d) Moving stairways shall be provided with a safety device to open the power circuit, apply the machine brake where required, and stop the moving stairway in case the tread chain or chains break; other than those operated by rack type links originally installed without such safety devices. If a pawl or dog instantaneous type safety is used, it shall be applied to the ascending portion of the treads, and there shall be one dog or pawl near the top of the ascending portion of the moving stairway platform for carrying passengers, and one near the bottom of this platform; and there shall be dogs or pawls located in intermediate positions such that the maximum distance between dogs or pawls measured along the moving stairway incline shall not exceed ten feet, unless otherwise permitted by law at the time of original installation. Pawls or dogs shall be cast or forged steel.

(e) The framework forming the support for the moving stairway mechanism at its lower end shall be of sufficient strength to safely retain the moving stairway platform if it should break at any portion of its length.

(f) Moving stairways operated by polyphase alternating current motors shall be provided with relays of the potential type which will prevent starting the motor if the phase rotation is in the wrong direction or there is a failure of any phase.

6.00: continued

(g) Where tension weights are used for tightening devices on moving stairways, provision shall be made to retain weights in the moving stairway truss in case the weights should fall.

(h) Skirt Obstruction Device. Requirements for same shall be as specified in 524 CMR 22.10(3)(h).

(7) Links and Chains.

(a) Rack type links, when used to drive the moving stairway treads, shall be of annealed steel castings of not less than 80,000 lbs. per square inch tensile strength, and shall be provided with friction-bearing surface on the back not less than one inch wide extending the full length of the links. The factor of safety shall not be less than twenty.

(b) Where chains are used to operate the treads they shall be constructed of metal of tensile strength of not less than 60,000 lbs. per square inch, and the factor of safety shall be not less than ten.

(c) Replacements of existing links shall be of forged steel with a safety factor of ten or annealed cast steel with a safety factor of 20.

(8) Angle of Inclination. The angle of inclination of a moving stairway shall not exceed 30° from the horizontal.

(9) Hand Rails. Moving stairways shall be equipped on both sides with moving hand rails, operating at the speed of the moving stairway and in the same direction of travel. Existing moving stairways used exclusively for employees need only be equipped with a moving hand rail on one side, providing the moving stairway is furnished on the side opposite with a smooth enclosure not less than seven feet high. If traction driven type of hand rail is used, an adjustable tension device must be furnished to maintain sufficient traction at all times.

(10) Balustrading. Moving stairways shall be provided on each side with solid balustrading. On the inside the balustrading shall be smooth without depressed or raised panelling or molding. Glass panels in balustrading are permitted if of the shatterproof or tempered type. There shall be no abrupt changes in width between the balustrading on the two sides of the moving stairway. Should any change in width be necessary for moving stairways, the change shall not be more than 8% of the greatest width. In changing from the greater to the smaller width, the change in the direction of the balustrading shall not exceed 15° from the line of the moving stairway travel.

(11) Width of Moving Stairways (Escalators).

(a) The width of a moving stairway shall be measured between the balustrading at a vertical height of 27" above the nose line of the treads unless otherwise permitted by law at the time of the original installation.

(b) Moving stairways shall be not less than 22" nor more than 48" wide, unless otherwise permitted by law at the time of the original installation.

(12) Moving Stairway (Escalator) Treads and Landings.

(a) Moving stairway treads shall be of material affording secure foothold, such as hard wood or other material of equal or greater strength.

(b) Moving stairway landings at the top and bottom of moving stairways shall be of material affording secure foothold and shall, where practicable, extend not less than three feet from the moving end or sides of the treads.

(13) Strength of Trusses or Girders. For moving stairways the trusses or girders shall be designed with a factor of safety of not less than five based on static loads, unless otherwise permitted by law at the time of the original installation.

(14) Machine Room Lights. There shall be a suitable light in every moving stairway machine room, as a permanent fixture which can be lighted without passing or reaching over any part of machinery.

6.00: continued

(15) Access. For moving stairways there shall be reasonable access provided for inspection and maintenance.

(16) Tests. A practical test in accordance with the requirements of M.G.L. c 143, § 63 shall consist of the following:

(a) Speed Test. The application of the overspeed safety device where called for shall be obtained by tripping the governor by hand at the rated speed.

(b) Reversal Test. The application of the reversal safety device shall be obtained by operating the moving stairway by hand in the reverse direction.

(c) Miscellaneous Safety Devices. Test of the machine brake and emergency stop buttons or switches shall be made to determine whether they function properly.

A practical test in accordance with the requirements M.G.L. c. 143, § 64 shall consist of the following:

(a) Speed Test. The application of the overspeed safety device where called for shall be obtained by tripping the governor by hand at the rated speed.

(b) Reversal Test. The application of the reversal safety device as called for in 524 CMR 6.00(6)(b) shall be obtained by operating the moving stairway by hand in the reverse direction.

(c) Miscellaneous Safety Devices. Test of the machine brake and emergency stop buttons or switches shall be made to determine whether they function properly.

REGULATORY AUTHORITY

524 CMR 6.00: M.G.L. c. 143, § 69.

NON-TEXT PAGE

524 CMR 7.00: MISCELLANEOUS REGULATIONS

Section

7.01: Miscellaneous Regulations
7.02: Registration Numbers
7.03: Reference to Other Applicable Regulatory Codes
7.04: Inspection Certificates

7.01: Miscellaneous Regulations

(1) Maintenance of Equipment. It shall be the duty of the owner to maintain in proper working order all parts of the elevator installations and to keep them in compliance with 524 CMR 7.00.

(2) Cleaning and Inspecting Tanks. Pressure and discharge tanks of hydraulic elevators shall be thoroughly cleaned and inspected at least once in every two years. Pressure tanks shall be painted inside at least once every two years.

(3) Testing Relief Valves. Relief valves on hydraulic elevator pumps shall be tested not less than once each year.

(4) Hoistway Pits. Elevator hoistways and pits shall be kept clean and dry, and shall not be used for storage.

(5) Machine Rooms and Car Tops. The top or cover of an elevator car shall be kept unobstructed. Entrances to hoistways and machine rooms shall be kept clear and accessible at all times.

(6) Hoistway Covers. No hoistway cover shall be used as a thoroughfare or passage unless the elevator is of the sidewalk type.

(7) Signs in Freight Elevators. Freight elevators shall have legible signs posted on each car and at each landing, prohibiting unauthorized persons from riding on or operating the elevator car.

(8) Piston Rods. Piston rods in tension of hydraulic elevators shall be exposed for inspection at least once in every five years.

7.02: Registration Numbers

(1) To provide a uniform system of identification, all new elevators, dumbwaiters, moving stairways and other permanently installed equipment subject to regulations of the Board shall be issued a permanent registration number by the Elevator Section, Division of Inspection, Department of Public Safety. This number shall be noted on the approved layout or drawings and on all other documents pertaining to the unit during its life, *i.e.* data, records, permit applications, operating certificates, accident reports, decommissioning records.

(2) A permanent record of the assigned registration numbers shall be maintained by the Elevator Section as directed by the Commissioner.

(3) Registration numbers shall be permanently affixed/attached to all the following:
- (a) Car crosshead front and center so as to be visible when the hoistway door is opened;
- (b) Machine, pump unit or drive unit;
- (c) On the certificate.
- (d) The number shall also be affixed to the main line disconnect switch.
- (e) Escalators, the plate shall be located near the handrail entrance brush on the side of the unit containing the stop/start section at each end of the unit and on the disconnect switch, controller or machine.

7.02: continued

(4) Registration numbers shall be a minimum of ½" in height and of a contrasting color from the background color on which it is applied or mounted. This identification number shall be applied in the form of a metal or plastic plate only.

(5) Existing Elevator Equipment. All permit applications for the required annual safety test shall be posted with the permanent registration number to be assigned to the unit. The inspector shall also note the registration number on the operating certificate before it is issued. The elevator firm conducting the annual safety test for the inspector having jurisdiction shall post the registration numbers on the equipment as provided in 524 CMR 7.02(3) as directed by the inspector.

(6) Only one registration number shall be assigned to each elevator.

(7) Permanent registration numbers shall not be assigned to builders' elevators installed under 524 CMR 25.00 or to temporary workmen's elevators installed under 524 CMR 28.00.

(8) The Commissioner of Public Safety may exempt cities and towns from the requirements of 524 CMR 7.02 where he has approved an alternate system of identification and where there is an approved system of elevator inspection.

7.03: References to Other Applicable Regulatory Codes

M.G.L. (Massachusetts General Laws) c. 143, §§ 62 through 71G.

Massachusetts Statutes, St. 1962, c. 288 and St. 1980, c. 324.

521 CMR (Architectural Barriers Code) Section 35.

527 CMR 12.00 (Massachusetts Electrical Code) Article 620, with any amendments.

780 CMR (Massachusetts State Building Code) Article 16; and section 431.0: High-Rise Buildings.

7.04: Inspection Certificates

The certificate of inspection when issued shall be posted in the car or the main floor lobby of the building.

REGULATORY AUTHORITY

524 CMR 7.00: M.G.L. c. 143, § 69.

524 CMR 8.00: PRACTICAL TESTS

Section

8.01: Practical Tests

8.01: Practical Tests

A practical test as required by M.G.L. c. 143, § 64, shall consist of the following:

(1) The initial "Acceptance Test" and subsequent annual safety tests shall be made of every power elevator under the supervision of an authorized inspector. Such tests shall conform to the following:

Acceptance Test: A contract-load safety test at governor tripping speed where applicable shall be made in the presence of the authorized inspector.

Subsequent Annual Tests: A safety test with no contract-load shall be made in the presence of the authorized inspector. The above acceptance tests shall be made in sequence once a year of all safety devices and equipment to determine that they function as required by the applicable code rules. It is further required that every fifth year a full-load safety test be conducted in the presence of a duly authorized inspector.

(2) Car and counterweight safeties and governors shall be tested as follows:

Governor operated instantaneous type safeties or sliding type safeties of elevators shall be tested at rated speed by tripping the governor by hand. The governor shall be separately tested for tripping speed.

(3) Each governor shall be sealed directly after testing by the authorized inspector conducting the test. No person, other than an authorized inspector, shall break or remove the seal.

(4) The application of a safety having no speed governor shall be obtained by a free drop test which may be made without detaching the ropes.

(5) Car and counterweight oil buffers, if any, shall be tested with no load on the platform at rated car speed.

(6) Contract Load Test for Hydraulic Elevators. A contract load test under the supervision of the authorized inspector shall be made of every hydraulic elevator and dumbwaiter before the elevator or dumbwaiter is placed in regular service.

(a) The test shall be made with no load and a test with full rated load on the car in order to determine the car speed under each specified condition of loading in both the up and down direction.

(b) A test check of the working pressure including, in case of pressure tanks, a check of the accuracy of the tank pressure gauge.

(c) A test of the pump relief valve cut off pressure shall be made in accordance with 524 CMR 17.23(6).

REGULATORY AUTHORITY

524 CMR 8.00: M.G.L. c. 143, § 69.

NON-TEXT PAGE

524 CMR 9.00: OPERATION OF ELEVATORS

Section

9.01: Operation of Elevators
9.02: Instructions to Operators

9.01: Operation of Elevators

(1) Licensed Operators. No person shall operate, and no owner, lessee, employer or his agent shall cause or permit to be operated, any elevator except by a person duly licensed for such service by the Department of Public Safety, except:

(a) Licensed operators are not required for automatic operation or continuous pressure operation passenger or freight elevators or shipper rope elevators, when equipped with the proper safeguards. Where an operator has been designated to be in permanent charge of such elevators or where a car switch is employed, said operator shall be licensed.

(b) An operator's license shall not be required of an elevator contractor or of a qualified mechanic engaged in the construction, maintenance, or repair of elevators or elevator shaftways, or of an inspector having authority to inspect elevators.

(2) Granting of Licenses.

(a) Whoever desires to act as operator of elevators herein required to be operated by a licensed person shall make application to the department on blanks to be furnished by the said department. A license shall not be granted to a person less than 18 years of age.

(b) The applicant shall be given a practical examination as to his knowledge of the operation of elevators, particularly as to the safeguarding of passengers and the requirements of 524 CMR 9.00, by an inspector or examiner having jurisdiction, and if found competent shall be granted a license by the executive head of the department. Such executive head may, however, delegate the power to grant licenses to any inspector of the department having jurisdiction.

(c) Licenses shall be issued until the date of birth of the licensee occurring more than 12 months but not more than 24 months after the effective date of such license. If any such license or the renewal thereof expires in an even year, any subsequent renewal shall expire on the next anniversary of the licensee's date of birth occurring in an even year. If any such license or renewal thereof expires in an odd year, any subsequent renewal shall expire on the next anniversary of the licensee's date of birth occurring in an odd year. A license issued to a person born on February 29th shall, for the purposes of 524 CMR 9.01, expire on March first. If a license has not been renewed within three years from the date of issuance, a re-examination shall be required.

(d) Should a license become lost, a duplicate thereof shall be granted upon application to the department granting the original license.

(e) The applications and a record of the licenses issued shall be kept by such department.

(3) Display of Licenses. A licensed operator shall at all times when operating an elevator be prepared to display his license on demand of the owner or tenant of the building, or of any person authorized to inspect the elevator, or of any police officer.

(4) Revocation and Suspension of Licenses.

(a) A wilful falsification in the matter of a statement in an application shall be deemed sufficient cause for the revocation at any time of a license granted on said application.

(b) A license may be suspended or revoked by an inspector having jurisdiction, if the holder is incompetent or untrustworthy or fails to comply with 524 CMR 9.00.

9.02: Instructions to Operators

(1) Learn these instructions thoroughly and keep a copy available for use at all times.

(2) Always open the stop switch or lock the operating mechanism when placing the elevator out of service.

(3) Be sure the operating mechanism is in the "STOP" position before closing the stop switch.

(4) Report any defects promptly to the person in charge.

(5) Do not attempt to make any repairs.

(6) Carry no passengers or freight while inspections, repairs, or adjustments are in progress, and operate the car only in response to directions from the inspector or person in charge. Do not move the car when anyone is in the pit or on top of the car except as he may direct.

(7) When in the opinion of the operator an excess load is to be carried, do not ride or allow others to ride on the elevator.

(8) Hoistway doors or gates shall always be closed and locked before the car is started. The car shall be brought to a stop at the landing level before either the car door or car gate, where provided, or the hoistway door or hoistway gate is opened manually.

(9) Keep car gates closed while car is running, and where no car gates are provided, keep passengers away from the open edge of the car platform.

(10) Limit the number of passengers or load to the contract capacity of the car and do not permit crowding or overloading.

(11) Do not reverse the operating device suddenly; stop the car before reversing.

(12) Move operating device to the stop position on approaching the terminal landings. Do not depend on the terminal stops in the ordinary operation of the car.

(13) Should the power go off while the car is in motion, move the operating device to the "STOP" position and start the car in the usual manner upon return of the power.

(14) Familiarize yourself with the emergency devices, understand their function, and know how to operate them.

(15) Should the car stop suddenly, shut off the power, call for the person in charge and operate the elevator only at his direction. While waiting, keep calm. Do not attempt to release any safety device; remember that it is safer to stay in the car until help arrives than to try to get out, and so instruct your passengers.

(16) Should the car refuse to stop, do not attempt to jump off.

(17) Before loading or unloading elevators with hand-rope type operation, lock the operating mechanism in the "STOP" position.

(18) Never leave the car in the ordinary course of operation nor leave the operating mechanism unprotected. When going off duty for any reason, even for a few minutes, be sure that the power is disconnected or that the operating mechanism is locked and the hoistway doors are closed.

(19) Always leave a hydraulic elevator operated by a lever at the lower landing with the lever in the position for down motion.

9.02: continued

(20) In running a belt-driven elevator, be sure to pull the hand-rope as far as possible when starting the car. In doing so, you throw the belt full on the tight pulley, and thus prevent it from slipping. In stopping, use the centering rope.

(21) Never allow anyone to scuffle or fool on the elevator. It is always dangerous.

(22) Never, under any condition, allow anyone to get on or off the car while it is in motion.

(23) Keep your mind on your work. Always remain at your post while the car is moving, so that you can stop it quickly in an emergency.

REGULATORY AUTHORITY

524 CMR 9.00: M.G.L. c. 143, § 69.

NON-TEXT PAGE

524 CMR 10.00: MAJOR ALTERATIONS OF ELEVATORS

Section

10.00 Major Alterations of Elevators

10.00: Major Alterations of Elevators

The following alterations, repairs and replacement of any equipment governed by 524 CMR shall be considered a major alteration and shall be performed by persons with a Massachusetts Elevator license as a construction, maintenance or repair mechanic in accordance with M.G.L. c. 143, § 71B.

(1) Increase in dead weight of car.

(2) Increase in dead weight of counterweight.

(3) Change in type of operation or control.

(4) Change in size and number of ropes.

(5) Change in type of guide rails.

(6) Replacement of or change in type of car or counterweight safety.

(7) Change in power supply.

(8) Replacement of driving machine by a new machine.

(9) Replacement of existing controller to a new controller.

(10) Replacement of existing machine brake to a new brake.

(11) Replacement of hoistway doors.

(12) Addition of hoistway locking devices, or car door or gate electric contacts.

(13) Addition of hoistway access switches

(14) Addition of car top operating devices.

(15) Addition of hoistway door and/or car door or gate operating devices.

(16) Addition of rope equalizers.

(17) Addition of auxiliary rope-fastening devices.

(18) Addition of car-leveling or truck zoning devices.

(19) Addition of roller guide shoes.

(20) Change in type of car loading classes A, B, C.

(21) Ventilation of hoistways and machinery spaces.

(22) Installation, additions, or alterations of fire emergency controls.

(23) Dismantlement or removal of an elevator or any elevator equipment in any building or structure undergoing repairs, renovations or remodeling, or where the hoistway is intended for reuse.

REGULATORY AUTHORITY

524 CMR 10.00: M.G.L. c. 143, § 69.

524 CMR 11.00: ELEVATORS PLACED OUT OF SERVICE

Section

11.00: Elevators Placed Out of Service

11.00: Elevators Placed Out of Service

All elevators and dumbwaiters placed out of active service for a period exceeding one year shall comply with the following:

(1) The owner or his agent shall notify the authorized elevator inspector in writing, giving the date when the elevator or dumbwaiter will be placed out of service.

(2) If the out of service exceeds one year from the date of notice received, the complete installation shall be subject to a complete inspection and safety test before again being placed in service.

(3) The car and counterweight shall be lowered to the lowest landing.

(4) All ropes removed.

(5) Main line fuses removed.

(6) Service switch opened and the cabinet sealed with a padlock.

(7) Where landing doors are in use, the doors shall be bolted securely to the closed position from the hoistway side.

(8) When landing gates are in place, the landing openings shall be totally enclosed and strongly reinforced.
EXCEPTION: The lowest landing door shall be locked from the landing side.

(9) Hydraulic decommissioning. When a hydraulic elevator is taken out of service the oil pipe line from the hoistway to the power unit, and the oil in the tank will be removed from the premises. The supply wires shall be disconnected at the main line switch and at the power unit.

REGULATORY AUTHORITY

524 CMR 11.00: M.G.L. c. 143, § 69.

NON-TEXT PAGE

524 CMR 12.00: ELEVATORS AND ESCALATORS (TAKING EFFECT JUNE 19, 1914 AND INCLUDING ALTERATIONS AND AMENDMENTS TAKING EFFECT DECEMBER 26, 1923)*

Section

12.01: Definitions
12.02: Shaftway Constructions
12.03: Cars and Car Enclosures
12.04: Machines and Machinery
12.05: Cables
12.06: Counterweights, Guide Rails and Bumpers
12.07: Controlling Devices and Terminal Stops
12.08: Miscellaneous
12.09: Sidewalk Elevators
12.10: Escalator Installations
12.11: General (Division E)
12.12: Practical Tests
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12.14: Instructions to Operators
12.15: Builders' Elevators and Temporary Use of Permanent Elevators

12.01: Definitions

In 524 CMR 12.00 the following terms shall have the meanings respectively assigned to them. They are not intended, however, as a complete glossary of terms used in connection with elevator installations.

A Car Door or Gate is the door or gate in the elevator car.

A Car sling is the supporting frame to which the car platform, upper and lower sets of guide shoes and the hoisting cables are usually attached.

A Double-belted Elevator is an elevator in which the machine is connected to a separate source of power, such as the shafting, by two belts or similar means, and in which the direction of motion is changed without reversal of the prime mover.

A Dumb-waiter is an elevator, equipped with a car, which has a clear platform area of not exceeding nine square feet, which is designed and used for freight only, and which has a carrying capacity not exceeding 500 lbs.

An Electric Elevator is an elevator in which the motion of the car is obtained by an electric motor directly applied to the elevator machinery.

An Elevator is a hoisting and lowering mechanism for the transportation of persons or materials, which is equipped with a car or solid level platform moving in guides at an angle of 30° or less from the vertical, which serves two or more fixed landings (including balconies and mezzanines) on the inside or outside of a building or structure, and which shall be enclosed and equipped as required by 524 CMR 12.00.

An Elevator Car or Platform is the load-carrying unit, including its supporting and guiding frame, and enclosure.

An Elevator Machine is the machinery and its equipment used in raising and lowering the elevator car or platform.

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*NOTE: Effective 1/1/96, 524 CMR 12.00 is repealed and replaced by 524 CMR 17.00.

12.01: continued

An Escalator is a moving continuous stairway or inclined runway designed for elevating or lowering passengers. (Endless belts, conveyors, chains, buckets, etc., used for the purpose of conveying and elevating materials alone and upon which passengers are at no time carried are not classed as escalators. Stevedores handling freight on wharf ramps, and other workmen similarly in charge of freight, riding on similar ramps are not classed as passengers.)

An Existing Installation is an elevator or escalator, the erection of which was begun before December 26, 1923, and not materially altered, nor moved to a different location subsequently thereto.

A Freight Elevator is an elevator used primarily for carrying freight.

A Full Automatic Gate is a gate which is opened automatically by the action of the elevator car as it approaches the landing, and which closes automatically by gravity as the car leaves the landing.

A Gravity Gate is a gate which is not opened by the motion of the car but which may be opened by hand, and which will be held open by the elevator car when the latter is at the landing, and which will close automatically by gravity when the elevator car leaves the landing.

A Hand Elevator is an elevator which is operated by hand or gravity, and which has no other power attached.

A Hatchway Elevator is an elevator running through floor openings provided with hatch covers, each of which is opened automatically as the car approaches the landing and is closed automatically as the car leaves the landing.

A Hydraulic Elevator is an elevator in which the motion of the car is obtained by liquid under pressure.

A Landing is that portion of a floor, balcony or platform used to receive and discharge passengers or freight.

A Landing Door or gate is the door or gate in the enclosure of the elevator shaft at any landing.

A Main Line circuit switch is a solenoid switch connected to open the line circuit of the motor and the brake release magnet coil.

A New Installation is:

(a) An elevator or escalator, the erection of which is begun on or after December 26, 1923.

(b) An existing elevator or escalator moved to a new location on or after December 26, 1923.

(c) An existing installation which is materially changed on or after December 26, 1923. (Any changes other than ordinary repairs are to be considered as material changes.)

(d) Any complete part of an existing installation which is replaced. (For instance, any complete new part supplied, such as machine, car, shaftway enclosure, gates, doors, etc., must be installed in accordance with the Regulations for new installations; but such existing parts as remain in service need not be changed to conform with the regulations for new installations.)

(e) If the speed of an existing elevator is increased, the installation becomes a new installation.

(f) If the capacity of an existing elevator is increased, the installation becomes a new installation.

12.01: continued

The Overtravel of an Elevator Car at the top of the shaftway is the vertical distance which the car platform can travel above the top terminal landing, without any part of the car or sling striking any part of the overhead structure.

Panelboard: A single panel or a group of panel units designed for assembly in the form of a single panel; including buses, and with or without switches and/or automatic overcurrent protective devices for the control of light, heat or power circuits of small individual as well as aggregate capacity; designed to be placed in a cabinet or cutout box placed in or against a wall or partition and accessible only from the front. (See "Switchboard")

A Passenger Elevator is an elevator used primarily for carrying passengers.

A Platform Elevator is a freight elevator with a platform having no suspension sling frame, but which is raised by cables dropping from winding drums or sheaves over the wellway and connected to the platform at four or more points.

A Plunger Elevator is an hydraulic elevator having a ram or plunger directly attached to the under side of the car platform.

Power Elevators excludes elevators operated by hand.

Rated Car Speed. The rated car speed of an elevator shall be the speed at which the machine lifts the rated load.

(a) Rated Load. The rated load of an elevator is the load which the elevator is designed and installed to lift in accordance with 524 CMR 12.00.
(b) Average Car Speed. The average car speed of an elevator shall be the mean between the speed with rated load up and down.
(c) Maximum Car Speed. The maximum car speed of an elevator shall be the greatest speed at which the elevator descends with rated load.

A Selective Automatic Button-control Elevator is an elevator the operation of which is controlled by buttons in such a manner that all landing stops are automatic.

A Semi or Half-automatic Gate is a gate which
(a) is opened by the ascending car approaching the landing;
(b) is not opened by the descending elevator car but which may be opened by hand;
(c) is held open by elevator car while the latter remains stationary at the landing;
(d) closes automatically by gravity when the elevator car leaves the landing.

A Shaftway is any hoistway, hatchway, well hole or other vertical opening or space in which the elevator or dumb-waiter is designed to operate.

A Shaftway Enclosure is any substantially vertical structure which separates the shaftway, either wholly or in part, from the floors or landings through which the shaftway extends.

A Sidewalk Elevator is a freight elevator, the hatch opening of which is located either inside or outside of the building, but which serves no landing above the sidewalk or exterior area, and which has no lifting or counterweight mechanism above the upper limits of travel, and to which the regulations contained in Division C only are applicable.

A Single-belted Elevator is an elevator in which the machine is connected to a reversible motor by a belt or other similar means.

A Steam Hydraulic Elevator is an elevator operated by water from a closed tank, to which steam or air pressure is applied to raise the car.

12.01: continued

A Suspension Frame is the structure, including the car sling, to which the hoisting cables are usually attached and which support the car floor and still.

Switchboard: A large single panel, frame or assembly of panels, on which are mounted, on the face or back or both, switches, overcurrent and other protective devices, buses and usually instruments. Switchboards are generally accessible from the rear as well as from the front and are not intended to be installed in cabinets. (See "Panelboard")

A Traction Elevator is an elevator whose elevating power is transmitted by means of traction between the lifting cables and the drums or sheaves.

The Travel of an Elevator or Dumb-waiter is the vertical distance from the lowest to the highest landing.

A Winding Drum Machine is an elevator machine in which the cables are fastened to a wind on a drum.

ELEVATOR INSTALLATIONS (EXCEPT SIDEWALK ELEVATORS)

12.02: Shaftway Construction

(1) Enclosures Around Elevator Shaftways in General. (524 CMR 12.02(1)(a) through (d) do not apply to elevators installed before June 19, 1914.)

(a) The shaftways of all elevators shall be enclosed throughout their height with walls of brick, or terra cotta, or wire lath and plaster, or wired glass set in metal frames or other fire-resisting construction, except (1) elevators serving only two adjacent stories; (2) elevators within the wellways of surrounding stairs; (3) platform elevators installed before December 26, 1923, and hatchway elevators; (4) elevators outside of buildings; and (5) that part of a dumbwaiter shaftway located between the floor and a counter-top.
(The details of construction, thickness of walls, thickness, size and method of setting wired glass, etc., shall conform to the local building requirements, if any, and otherwise to the requirements of the inspector having jurisdiction. All sash shall be stationary unless in the outer wall of the building. Frames and sash in the outer wall of the building may be of wood and the sash glazed with common glass if not conflicting with the local building requirements. Two or more elevators may be installed in the same shaftway without partitions between them.)

(b) Elevator machine rooms hereafter installed in connection with shaftways enclosed with fire-resisting construction shall be enclosed, except on the shaftway side, with enclosures of fire-proof construction, or a fire-proof partition shall be installed separating the machine from the shaftway, such partition being cut out only for cables and machinery, and fitting closely around such cables and machinery. For elevators installed before December 26, 1923, a 3/16" steel or iron plate may be used in place of the fireproof partition called for above.

(c) Fire-resisting shaftway enclosures shall be extended through and at least three feet above the roof if the elevator serves the top story of the building, except in the case of a dumb-waiter shaftway terminating under a counter-top, and except where a solid platform is located under the machinery and sheaves at the top of the shaftway entirely blocking it except for the openings for cables.

(d) Where the fire-resisting shaftway enclosures are not required to continue through the roof, the top of the shaftway shall be of fireresisting construction equivalent to that required for the walls.

(e) For elevators installed before June 19, 1914, enclosures or guards shall be located around the shaftways in each story (except at the landing openings) of power elevators located in buildings and which are not of platform-type or of hatchway-type. The enclosures shall be not less than seven feet high, of solid construction, or of open construction which will reject a ball two inches in diameter, and shall be securely fastened in place.

12.02: continued

(2) Skylights and Windows in Elevator Shaftways. (524 CMR 12.02(2)(a) and (b) do not apply to elevators installed before June 19, 1914).

(a) If the fire-resisting shaftway enclosures continue through the roof, a skylight or skylights shall be located in the top of the shaftway, or a window or windows shall be located in the side walls of the enclosure, at the top, unless there is a solid platform at the top of the shaftway entirely blocking it except for openings for cables, etc. The total glass area of such skylights or windows shall be in each case (1) not less than ½ the area of the shaftway; (2) not less than three square feet if the area of the shaftway is three square feet or more; and (3) the full area of the shaftway if the latter is less than three square feet. The glass in the skylights and windows must be plain glass, not wired glass, or the skylights and windows must be arranged to open automatically to the required area by the fusing of fusible links inside of the shaftway near the top, in which case wired glass may be used. If plain glass is used in a skylight, the skylight shall be protected by a galvanized iron or steel netting of not more than one inch mesh, made of not less than No. 12 gage wire, supported on metal supports not less than six inches above the skylight.

(b) If there is a solid platform under the machinery and sheaves (see 524 CMR 12.02(18)) at the top of the shaftway entirely blocking it except for the openings for cables, etc., windows of construction and as nearly as possible the area specified in 524 CMR 12.02(2)(a) shall be installed in the shaftway immediately below such solid floor, and either in the outside wall of the building or above the roof. (If there is no outside wall forming the shaftway, and if the solid floor in the shaftway is not above the roof, no vent, skylights or windows will be required. Vent windows above the roof and below the solid floor in the shaftway need not be located so close to the roof as to interfere with roof flashing.)

(c) Exterior windows in elevator shaftways shall be protected by vertical metal bars, not less than ⅝" in diameter, located on the outside of the windows, except existing elevators having metal bars on inside of windows, spaced and attached as required by 524 CMR 12.02(2)(d) and (e).

(d) The bars shall be attached to the masonry where there is any, and in all cases firmly secured, and in such a manner that they will not readily become loosened through the action of the weather.

(e) Such bars, if of iron or steel, shall be kept thoroughly painted.

(3) Enclosures around Shaftways of Elevators Serving Only Two Adjacent Stories. (524 CMR 12.02(3) does not apply to elevators installed before June 19, 1914.)

(a) The shaftways of elevators serving only two adjacent stories shall be enclosed throughout the entire height of, at least one of the two stories with fire-resisting construction, such as specified in 524 CMR 12.02(1)(a), except shaftways around (1) dumb-waiters installed before December 26, 1923; (2) elevators within the well ways of surrounding stairs; (3) platform elevators installed before December 26, 1923, and hatchway elevators; and (4) elevators outside of building.

(b) If the fire-resisting construction is used in the lower of the two stories, the shaftway in the upper story shall be enclosed to a height of not less than seven feet above the floor with metal grille work which will reject a ball two inches in diameter, or with equivalent non-combustible construction.

(d) If the fire-resisting construction is used in the upper of the two stories, and the elevator is a freight elevator, the shaftway in the lower story shall be enclosed with guards not less than three feet four inches above the floor, such as grille work, sheathing, wood or metal double-rail fences, etc., securely fastened in place.

(e) The requirements of 524 CMR 12.02(1)(b), (c), (d), and (2)(a) and (b), shall be fulfilled where they are applicable to the shaftway enclosures of elevators serving only two adjacent stories.

(4) Enclosures around Elevator Shaftways in Stairwells. (524 CMR 12.02(4) does not apply to elevators installed before June 19, 1914.)

(a) The shaftways of elevators within the well-ways of surrounding stairs shall be enclosed in each story with either (1) fire-resisting construction as specified under 524 CMR 12.02(1)(a); or (2) metal grille work of such design as will reject a ball two inches in diameter.

12.02: continued

(b) For elevators hereafter installed such enclosures shall extend the full height of the story on all sides.

(c) For elevators installed before December 26, 1923, such enclosures shall extend from floor to ceiling at the side through which there is an entrance to the elevator car, except on the top floor, and shall extend at least seven feet elsewhere above stair treads and landings.

(5) Automatic Hatch Covers and Enclosures around Shaftways of Hatchway Elevators, Platform Elevators Installed before December 26, 1923, and Hand Elevators.

(a) Enclosures or guards, not less than three feet four inches the floor, such as grille work, sheathing, wood or metal double rail fences, etc., securely fastened in place, shall be located (except at landing openings) around elevator shaftway openings equipped with vertical lifting hatch covers above which at the upper limit of their travel there is a clear space of two feet or more.

(b) Similar enclosures or guards shall be placed around shaftways of elevators, at the lowest floor which the elevator serves, if the opening in the floor above is protected by a hatch cover.

(c) Automatic hatch covers shall be made of not thinner than ⅞" stock, strongly battened, if of wood, or of equally strong and stiff metal construction.

(d) Wood automatic hatch covers shall be covered on their under sides and on their edges with sheet tin or galvanized steel with locked joints, with nail heads concealed under the joints. (Tin covering installed before June 19, 1914, need not be replaced, even if the joints are not locked and the nail heads are not concealed.)

(e) Hinges on automatic hatch covers shall be either heavy T or heavy strap hinges secured to the floor with lag-screws, or otherwise equally securely fastened and bolted through the hatch covers. (Hinges installed before June 19, 1914, need not comply with 524 CMR 12.00 unless they are loose or insecure; but when new hinges are installed they must comply with 524 CMR 12.00.)

(f) Hinged hatch covers shall not be used on floor openings where the car has a clear platform area of more than 50 square feet, except elevators installed before June 19, 1914.

(g) No hook or other means of fastening hatch covers open shall be permitted.

(h) Where other than fire-proof enclosures are built around the shaftways of hatchway elevators, the hatch covers shall not be omitted on that account.

(i) The shaftways of platform elevators, installed after June 19, 1914, which serve two floors only need not be enclosed except that the sides of the floor opening shall be protected by guards not less than three feet four inches above the floor such as grille work, sheathing, wood or metal double-rail fences, etc., securely fastened in place.

(j) The shaftways of platform elevators, installed after June 19, 1914, which serve more than two floors shall be completely enclosed from the second story floor up with a fire-resisting construction such as specified in 524 CMR 12.02(1)(a).

(k) The requirements of 524 CMR 12.02(1)(b), (c), and (d) and (2)(a) and (b) shall be fulfilled where they are applicable to shaftway enclosures of platform elevators installed after June 19, 1914.

(l) The sides of floor openings for platform elevators and for hand elevators installed before June 19, 1914, shall be protected by guards not less than two feet ten inches above the floor such as grille work, sheathing, wood or metal double-rail fences, etc., securely fastened in place.

(6) Enclosures around Elevator Shaftways outside of Buildings. The shaftways of elevators located outside of buildings shall be enclosed to a height seven feet above the ground with a solid enclosure or with a grille work or lattice work which will reject a ball two inches in diameter.

(7) Opening of Standing Portions of Enclosures. Standing portions of enclosures arranged to open to form larger openings than are obtained at the regular landing doors shall be securely fastened at the top and bottom.

12.02: continued

(8) Netting on Grille-Work Enclosures. Grille-work shaftway enclosures, having mesh larger than ⅜" square shall be covered to a height not less than six feet six inches above the landing level or stair treads, where there are surrounding stairs, with wire netting of not more than ⅜" square mesh made of wire not smaller than No. 20 gage, securely attached to grille-work (1) where there is less than four inches clearance between the grille-work and any portion of the car or of the counterweight, and (2) where a landing door slides by with a clearance of less than four inches.

(9) Enclosures around Counterweights.

(a) Counterweights running in isolated shaftways shall be enclosed throughout their height with fire-resisting construction or with sheet steel of not less than No. 16 gage, except where located outside of buildings, in which case solid structures, not less than seven feet shall be installed. Where enclosures installed before June 19, 1914, around such counterweights are not solid they shall be covered with wire netting of not larger than ⅜" square mesh, made of wire not smaller than No. 20 gage.

(b) The counterweight runs of elevators, except dumb-waiters and except hatchway elevators shall be enclosed from a height 12" above the bottom of the pit to a height not less than seven feet above the bottom of the pit, except where compensating chains or ropes would interfere and except where the bumpers under the counterweights are five feet or more high and except for elevators installed before June 19, 1914, where there is insufficient clearance.

(c) The material used for such enclosures in fire-proof shafts shall be non-combustible, and in any case, if made of open work, shall be of such design as shall reject a ½" ball.

(d) The counterweight runways of hatchway elevators, except dumb-waiters, shall be boxed in from bottom of the pit to a point as close to the sheaves as practicable. The tops of such enclosures shall be covered except for such openings as may be necessary for the cables.

(e) Where the entire counterweight runway is boxed in there shall be a removable section not less than two feet high and the full width of the boxing, located above the top landing. If the elevator is of the hatchway type, the removable section shall be at such a height as to just clear the hatchway door when open.

(f) In all cases the lower part of the counterweight enclosure shall be made removable from the top of the counterweight down.

(10) Openings and Set-backs in Outside Walls of Freight Elevator Shaft ways.

(524 CMR 12.02(10) does not apply to dumb-waiters.)

(a) Where the enclosing wall of the shaftway of a power-freight elevator is the outside wall of a building, and where the elevator car is open toward this outside wall, the shaftway side of the outside wall shall be filled in, up to six feet six inches above the top landing level, with substantial noncombustible material, the openings of which shall reject a four-inch ball, wherever the clearance between the elevator car and the wall is more than four inches.

(b) For elevators installed before December 26, 1923, the filling-in may be done with any form of construction giving a firm, flush surface if there is no conflict with local building regulations; or it may be done with wooden slats not less than three inches wide by ⅞" thick and set vertically not more than four inches apart; or it may be done with metal pipes or bars set vertically not more than four inches apart, provided that such slats, pipes or bars are strongly secured in place with no projections into the shaftway and with all cross bars and other supports, except close-fitting pipe clips, at the back of such slats, pipes or bars.

(c) Whatever form of construction is used for filling in, the clearance between the face of the filling-in material and the car shall not be more than two inches.

(d) Window or other openings or recesses in such outside wall, except the landing door openings, shall be filled in flush or slatted or barred as provided above, whatever may be the clearance between the elevator car and the wall. The filling-in material shall be made flush with the wall or with the filling-in on the wall as the case may be.

12.02: continued

(e) For elevators installed before December 26, 1923, if the elevator car is provided on the side adjacent to the outside wall with a gate which closes automatically when the ascending car leaves the landing at which there is an opening in the outside wall, or if the gate is provided with an interlocking device, which prevents the starting of the car until the gate is closed, and if the gate is of construction and dimensions specified in 524 CMR 12.02(15)(a) and (b) for landing gates for openings in outside wall, then the elevator car shall not be considered as open on the side towards the outside wall, and the filling-in of set-backs and openings in such wall shall not be required above the landing opening in the outside wall.

(11) Thresholds, Projections and Recesses.

(a) Strong and substantial bevelled metal or wood plates shall be located under all thresholds, beams and other fixed construction projecting into shaftways one inch or more beyond the general line of the shaftways of the elevator on sides where there are car openings. Metal plates when not backed with wood shall be made of not less than No. 12 B & S. gage metal. Recesses in shaftway enclosures on sides where there are car openings shall be filled in flush with the line of the shaftway or bevelled. (Dumb-waiters are excepted from 524 CMR 12.02(11).)

(b) The bevelled plates shall extend from the edge of the projection to the vertical wall, and the bevelled surfaces shall make an angle of not less than 60° with the horizontal.

(12) Clearances between Cars, Counterweights and Shaftways. (524 CMR 12.02(12) does not apply to dumb-waiters, hand elevators and to elevators installed before June 19,1914.)

(a) There shall be a clearance of not less than ¾" between cars and the shaftway enclosures and a clearance of not less than one inch between cars and their counterweights.

(b) The clearance between the sill of car and the threshold of landing shall not be less than ¾" nor more than 1½".

(c) There shall be a clearance between elevator counterweights and the shaftways of not less than ¾".

(13) Landing Doors. (524 CMR 12.02(13)(b) and (i) do not apply to elevators installed before June 14, 1914).

(a) Landing openings in solid fire-resisting shaftways enclosures shall be provided with fire-resisting landing doors and frames without open grille work or movable panels or other openings. Tinclad doors, rolling steel doors, Kalamein doors, hollow metal fire doors, steel frame doors glazed with wire glass, or doors of other similar construction shall be considered as "fire-resisting." Wired glass panels may be used in doors, but shall be subject to the restrictions specified in Regulation 1a, Section 1, Division B.

(b) Landing openings in grille-work shaftway enclosures of elevators shall be provided with landing doors, made either of fire-resisting construction or of grille work, which will reject a ball two inches in diameter.

(c) Landing doors for passenger elevators shall slide in a horizontal direction, except that swing doors will be permitted when equipped and used with an interlocking device, which prevents the starting of the elevator when any landing door is open, and prevents the door from being opened when the elevator car is not at the landing.

(d) Landing doors for passenger elevators and for freight elevators without landing gates, except dumb-waiters, when not in use shall be kept locked, and shall be of such construction and design that when locked they cannot be opened from the landing side without a key, except when the car is at the landing. Such landing doors need not be arranged so that they can be opened from the landing side even when the car is at the landing, except in the case of a selective automatic button-control type elevator or a similar elevator where there is no operator.

((e) Reserved)

12.02: continued

(f) Landing doors for selective automatic button-control elevators, except dumb-waiters, and except where no operating device is provided at the landings, are to be self-locking and equipped with interlocking devices such that (1) no landing door can be opened unless the car is at the landing, and (2) the car cannot be started unless all the landing doors are closed.

(g) When car-switch control is used in a selective automatic button-control elevator, the interlocking devices shall remain in operation.

(h) Landing doors for elevators with shipper ropes accessible from the landings when the landing doors are closed shall be self-locking and equipped with interlocking devices such that (1) no landing door can be operated unless the car is at the landing, and (2) the car cannot be started unless all landing doors are closed.

(i) Landing doors for passenger elevators and for freight elevators which have no landing gates shall be set not more than three inches back from the edges of the thresholds, and so that no part of the door or its hardware shall project into the shaftway beyond the edges of the thresholds. Where doors or solid gates in two parts are used, in which the lower part when open forms the threshold, the door may project into the shaftway as may be necessary, provided that the lower edge of the lower half of the door is bevelled, in accordance with 524 CMR 12.02(11)(a). Care should be taken in designing landing doors and enclosure fronts to allow for the closing and locking mechanism of the doors, for door checks, etc.: two inches is often required for such hardware.

(j) Landing doors for dumb-waiters, where the bottom of the opening is not less than 18" above the landing floor, may be counterbalanced to stay open, but if the shaftway enclosures are of fire-resisting construction, fusible links are to be located inside of the shaftway, or at the lower edges of the doors, and so connected that upon the melting of the links the doors will close.

(k) Landing doors for dumb-waiters, where the bottom of the opening is less than 18" above the landing floor and the door opening is large enough to be mistaken for a doorway to stairs or to an adjacent room, shall be in two parts, one over the other, the lower of which shall extend at least 18" above the landing floor and shall be arranged to be opened only after the upper part has been opened, or gates which close when the car leaves the landings shall be installed in addition to the landing doors. The upper part of the two part doors may be counterbalanced to stay open, and if so shall be provided with fusible links as in 524 CMR 12.02(13)(j).

(l) Dumb-waiters which are under counter-tops at the upper limit of their travel are not required to have landing doors.

(m) Landing doors which close automatically when the car leaves the landing may be considered as solid gates.

(n) Landing doors for elevators hereafter installed used for raising and lowering automobiles shall be equipped with an interlocking device which prevents the starting of the elevator when any landing door is open and prevents the opening of the door when the car is not at the landing.

(o) Landing openings for elevators installed before December 26, 1923, and used for raising and lowering automobiles, shall be equipped with chains or other suitable guards of sufficient strength, so located and securely fastened as to prevent an automobile from running into the shaftway, unless the landing doors are provided with interlocking devices as specified in 524 CMR 12.02(13)(n). Such chains shall be kept in place at all times, except at the landing at which the elevator is standing at rest.

(p) Elevator landing doors shall not open by gravity, except where provided with interlocks to prevent the starting of the elevator unless all landing doors are positively and securely closed and locked.

(q) Power operated landing doors shall be arranged so that the motion of the door can be stopped by the operator at any point of its travel.

(r) Power operated landing doors shall be equipped with interlocks, (1) to prevent the starting of the elevator when any landing door is open, and (2) to prevent a door from being opened, except the door at the landing at which the car is standing at rest. The interlock shall not prevent the movement of the car when the car is being moved toward the landing by a car leveling device.

12.02: continued

(s) Means shall be provided to prevent the starting of the car by the closing of the landing doors, unless the elevator is provided with a car gate of door with an interlocking device as specified in 524 CMR 12.02(4)(c).

(14) Landing Gates in General. (524 CMR 12.02(14)(d),(e),(h) and (i) do not apply to gates installed before June 19, 1914).

(a) Freight elevators having shaftway enclosures or guards except dumb-waiters, shall have inside landing openings in such enclosures and guards protected by gates which shall close automatically when the elevator car leaves the landing, except that no such gate shall be required at (1) a landing opening where there is a landing door, or a gate equivalent to a door, which is equipped with an interlocking device such that the door or equivalent gate can be opened only when the car is at the landing, and that the car can be started only when the door or equivalent gate is closed: or (2) at any landing opening of a car operated by a licensed operator and having at all landing openings doors or gates equivalent to doors, so arranged that they can be opened only from the shaftway side, except by key, and which are always closed before the car leaves the landing. Gates shall be installed at landing openings of freight elevators located outside of building, even though such elevators have no shaftway enclosures.

(b) The used sides of hatch openings, having hatch covers other than vertical lifting hatch covers, shall be protected by gates which shall close automatically when the car leaves the landing, where necessary to prevent hatch covers from being used as thoroughfares or passageways.

(c) The used sides of hatch openings having vertical lifting hatch covers, above which, at their lightest limit of travel, there is less than two feet head room, shall be protected by gates which shall close automatically when the car leaves the landing.

(d) Automatically closing landing gates of collapsible type or those made in parts, where the parts pass by each other in such a manner as to cause opportunity for injury due to shear, shall not be used. Automatically closing landing gates in two or more parts which meet in closing landing gates in two or more parts which meet in closing shall not be used unless they are arranged to be opened from the shaftway side only, the car is always in charge of an operator, and the gates are so retarded in closing as to remove danger of injury.

(e) Doors which close automatically when the car leaves the landings shall be considered as solid gates, and shall be subject to the same restrictions to avoid injury due to shear or to the coming together of two or more parts of the door as are open-work gates. A gate made in two or more parts, which slide or telescope by each other in the same direction, is not prohibited by 524 CMR 12.00, if the gates are solid or if the openings are ⅜ inches square or smaller, and if the edges of adjacent parts of the gates always lap so that the danger of injury due to shear is eliminated.

(f) Gates may be "full-automatic", "semi-automatic" or "gravity" gates but shall close by gravity and not by direct mechanical action of the car. (Although gates shall not be closed by the direct mechanical action of the car, their speed of closing may be retarded by the direct mechanical action of the car.)

(g) Gates are to be made of metal or of hard wood of at least as great fiber strength as ash, and are to be strong and rigid and so constructed and installed that they cannot be sprung from their guides. Bar gates hinged at one end shall be of such design and construction as to insure their accurate closing and their rigid support when closed.

(h) The joints of wood gate frames shall be strongly reinforced with metal plates.

(i) Gate shoes and runs on the operating side are to be of metal.

(j) No gate, when closed, is to be less than three feet and four inches in height, measured from the sill to the top of the upper horizontal member of the gate, except that gates installed before June 19, 1914, need not be more than two feet and eight inches in height when closed.

(k) The lower edge of the lowest horizontal member of any gate, when closed, shall be not more than three feet and four inches above the sill.

(l) Gale counterweights shall be boxed in or shall run in metal guides from which they cannot be dislodged. The bottoms of the boxes or of the guides shall be of such construction that the counterweights will be securely held if the counterweight ropes should break.

12.02: continued

(15) Landing Openings in Outside Walls.

(a) Landing openings in outside walls shall be provided with solid gates or doors without openings, except that existing gates may be of such design as will reject a ball two inches in diameter.

(b) The tope of such a gate or door, when closed, shall not be less than six feet above the sill, and the bottom shall be not more than six inches above the sill, except that where the landing opening in the outside wall is in the top story of the building, the top of the gate or door need be only three feet and four inches high above the sill, and except that a gate installed before June 19, 1914, which fulfills 524 CMR 12.02(15)(a) and is not less than four feet high, need not be replaced by a new gate.

(c) Gates or doors at landing openings in outside walls shall be equipped with locking devices which will prevent the opening of the gates or doors from the outside, and shall be arranged to close and lock automatically when the car leaves the landing, except when the door is provided with an interlock to prevent the starting of the elevator, unless the door is closed and locked. The lock or interlocking mechanism shall be so located and installed that it cannot be reached by hand from outside of the shaftway when the gate or door is closed. Such gates or doors must be kept closed and locked except when the elevator is in use at that landing. If the gate is made solid and fills the whole opening it becomes a door rather than a gate, but must, nevertheless, be equipped with the interlocking and self-closing and self-locking device.

(d) Where the elevator is set back in a vestibule or corridor with the landing opening not actually in the outside wall, but with an opening in the outside wall providing access to the landing opening and usually left open, thus leaving the landing gate or door accessible to unauthorized persons, the gate or door at the landing opening shall be the same as the gates herein specified for openings actually in outside walls.

(e) When the opening in the outside wall is at a bridge above the ground, and not open to the public, the provisions of 524 CMR 12.02(15)(a) through (15)(d), do not apply. Such opening shall be provided with gates as specified in 524 CMR 12.02(14)(a) through (14)(l).

(16) Landing Gates at Ground Openings of Elevators Outside of Building. Gates at the ground openings to elevators outside of building shall be like the gates specified in 524 CMR 12.02(15) for landing gates at opening in outside walls.

(17) Pits and Thoroughfares under Elevators. (524 CMR 12.02(17) does not apply to elevators installed before June 19, 1914.)

(a) There shall be a pit at least three feet deep at the bottom of the shaftways of power elevators except dumb-waiters and except platform elevators installed before December 26, 1923. Where new elevators are installed in existing buildings, a less depth of pit than three feet may be permitted by inspector having jurisdiction if, in his opinion, a depth of three feet is structurally impracticable.

(b) If a car or counterweight does not run to the lowest floor of a building and the space under the bottom of the shaftway of such car or counterweight is used for any purpose, the construction of the bottom of the shaftway under such car or counterweight shall be such as to withstand, without injury, the impact of the car loaded to its rated capacity and the impact of the counterweight, descending at the rated car speed, or at governor tripping speed for elevators hereafter installed where a speed governor is used. In addition, the counterweight shall be equipped with a safety device called for in Regulation 5c, Section 2, Division B.

(18) Platform at Top of Shaftway.

(a) There shall be a platform immediately under the machinery and sheaves, if any, at the top of the shaftway of every elevator except dumb-waiters, hatchway elevators, and platform elevators installed before December 26, 1923. For elevators installed before June 19, 1914, the platform at top of shaftway may be omitted if there is a cover on the car and the clearance between the cover and the platform is so small as to be a source of danger to a man on the car cover.

12.02: continued

(b) The platform shall fill the shaftway if the latter has a cross sectional area of 50 square feet or less: otherwise the platform need extend only two feet outside of all sheaves and machinery which should be reached for oiling and inspection.

(c) If the platform does not fill the entire shaftway, the edge of the platform shall be protected by a solid baseboard at least six inches high, and where the space between the platform and the wall of the shaft exceeds 12" there shall be a hand rail securely fastened in place three feet six inches above the platform.

(d) The platform shall be built and supported for a safe live load of not less than 50 lb. per square foot.

(e) If the platform is made of grating it shall be of such design as will reject a ball one and one-half inches in diameter and upon the upper side of the grating wire netting of not more than ⅜" square mesh and not smaller than No. 20 wire shall be fastened. For elevators installed before June 19, 1914, the design of the grating need not be such as to reject a ball 1½" in diameter.

(f) The platform, if of wood, shall be made solid of not less than three-inch plank, except that for elevators installed before June 19, 1914, platforms complying with 524 CMR 12.02(18)(d) need not be replaced.

(g) Reasonable access to the sheaves and machinery shall be provided above the level of the platform independent of the elevator car, except that for elevators installed before June 19, 1914, when it is impracticable to reach the platform by an opening above the platform level, a ladder from the top landing to an opening in the platform itself will be permitted: but in this case such means of access is for emergency use only, the normal means of access being from the top of the car.

(19) Supports for Machines and Sheaves. (524 CMR 12.02(19) does not apply to elevators installed before June 19, 1914.)

(a) For elevators hereafter installed the beams supporting the machine or overhead sheaves of power elevators, except dumb-waiters and hatchway type, shall be of steel. The load to be supported by the elevator machine beams, when the elevator winding machine is directly supported by them and the car-hoisting cables drop vertically to the car, shall be calculated as not less than the weight of the stationary-load, plus the weight of the counterweight and twice the weight of the car and its maximum rated load.

(b) The load shall be calculated as stated in 524 CMR 12.02(19)(a) when the hoisting cables lead in a substantially horizontal direction from other supports to leading sheaves over the wellway.

(c) When the hoisting cables lead from the elevator machine below in a substantially vertical direction to sheaves over the wellway, the load to be supported by these overhead sheave beams shall be calculated as the weight of the stationary load resting upon them plus twice the weight of the counterweights, plus four times the weight of the car and of its maximum rated load.

(d) The worm-gear mechanism and motor of hanger-type elevator machines shall not be located in the shaftway, except for dumb-waiters.

(20) Car and Counterweight Overtravel at Top of Shaftway. (524 CMR 12.02(20)(a) and (b) does not apply to elevators installed before June 19,1914.)

12.02: continued

a. Car and Counterweight Over-travel at Top of Shaftway of Power Elevator

Elevators Installed before December 26, 1923.

Over travel (Feet)	Speed, Feet per Minute		Travel Distance			Exceptions
			Stories	Feet		
	From —	To —		From —	To —	
1	-	60	Not over 1	-	15	Dumb-waiters
2	-	100	More than 1	-	50	Dumb-waiters
2	-	100	Not over 1	15	50	Dumb-waiters
3	-	250	Any number	50	250	Dumb-waiters
3	101	250	Any number	Any	distance	Dumb-waiters
4	251	350	Any number	Any	distance	Dumb-waiters
5	351	and over	Any number	Any	distance	Dumb-waiters

Elevators Installed after December 26, 1923

Over travel (Feet)	Speed, Feet per Minute From —	Speed, Feet per Minute To —	Stories	Feet From —	Feet To —	Exceptions
1	-	60	Not over 1	-	15	Dumb-waiters
2	-	100	More than 1	-	50	Dumb-waiters
4	101	350	Any number	Any	distance	Dumb-waiters
5	351	450	Any number	Any	distance	Plunger elevators and dumbwaiters
6	451	and over	Any number	Any	distance	Plunger elevators and dumbwaiters

(a) The minimum over-travel of a hand elevator car and counterweight shall be one foot irrespective of the travel.

(b) Counterweight Stops. There shall be secured at the upper limit of travel of the counterweights of all drum type power elevators an I-beam or other obstruction so that the counterweights cannot be drawn into the overhead sheaves.

12.03: Cars and Car Enclosures

(524 CMR 12.03(b), (c) and (d) does not apply to elevators installed before June 19, 1914.)

(1) Car Construction.

(a) Power elevator cars hereafter installed shall be constructed with steel suspension frames designed with a minimum factor of safety of at least eight based on the maximum rated carrying capacity plus the weight of the unloaded car, except elevators of the plunger type which are not provided with counterweights.

(b) Power passenger elevator cars installed before December 26, 1923, shall be constructed with steel suspension frames in accordance with 524 CMR 12.03(1)(a).

(c) Power freight elevator cars installed before December 26, 1923, having a lifting capacity of 3,000 lb. or over, and a platform area of 40 square feet or more, shall be constructed with steel suspension frames.

(d) No cast iron shall be used in tension as a suspension member of the suspension frame of any car.

(e) Hand elevator cars hereafter installed shall be constructed with suspension frames designed with a factor safety of not less than four for metal or six for wood, based on the rated load uniformly distributed.

12.03: continued

(f) The car platforms of plunger elevators shall be secured to heads of the plungers. If the plungers are made in more than three sections the car platforms shall be secured to the bottom heads of the plungers by safety cables run inside of the plungers.

(g) No elevator car, except a dumb-waiter car, shall have more than one compartment, except that elevators installed before June 19, 1914, and having more than one compartment shall be provided with an interlocking device such that either (1) the car cannot be operated from either compartment unless the car door or car gate of the other compartment is closed, or (2) the car cannot be operated from either compartment unless all of the landing doors are closed.

(h) Two cars balancing each other, and operated by the same machine, shall not be used except for (1) dumb-waiters and (2) freight elevators serving two floors only, of which all the landing openings are protected by gates or doors equipped with interlocking devices such that the cars cannot be operated unless all the landing gates or doors are closed. The interlocking device may be omitted on such elevators, at the discretion of the inspector having jurisdiction, where the nature of the car is such that there is no reason for a person to travel on the car or to step on the car to load or unload and where such traveling or stepping on is prohibited.

(2) Car Enclosures. (524 CMR 12.03(2)(c) and (j) do not apply to elevators installed before June 19, 1914).

(a) Elevator car enclosures or cages shall be secured to the car platforms and to the suspension slings in such manner that they cannot work loose or be readily displaced.

(b) Passenger elevator cars shall be enclosed on all unused sides and on the top. The enclosures may be of wood or of metal, solid or open work but if of open work, the design shall be such as will reject a ball two inches in diameter, except that for elevators installed before June 19, 1914, the design need not be such as will reject a ball two inches in diameter.

(c) No power passenger elevator car shall have more than two door openings.

(d) Freight elevators including dumb-waiters, platform and sidewalk elevators shall be enclosed full height to car top on all unused sides, or to the crossheads where the crossheads are less than six feet high, and on the counterweight side to the height of the crossheads. The enclosure in front of the counterweight shall be of rigid construction and shall extend not less than one foot beyond the counterweight on each side, where the crossheads are more than six feet above the platform. The enclosures may be wood or metal, solid or open work, but if open work the design shall be such as will reject a ball two inches in diameter.

(e) The car dome on a power passenger elevator installed before December 26, 1923, having no gate or door at the opening of the car, or having no interlocking device such that the car cannot be started when any landing door is open, shall be cut back above the door opening, or the section shall be hinged with brass, bronze or composition hinges above the door opening, without locking, to provide an unobstructed space 15" deep from the edge of threshold and extending the entire width of the car door opening.

(f) Power freight elevator cars installed before December 26, 1923, except dumb-waiters and except platform and sidewalk elevator cars, shall be enclosed not less than six feet and six inches high on all unused sides, or to the crossheads where the crossheads are less than six feet and six inches high, and on the counterweight side to the height of the crossheads as specified in 524 CMR 12.03(2)(d). The enclosures may be wood or metal, solid or open work, but if open work the design shall be such as will reject a ball two inches in diameter.

(g) Where the enclosure of a power freight elevator car is cut away at the front of the car to make the shipper ropes accessible, such opening in the enclosure shall be cut low enough to prevent injury to the hand of the operator, and the lower edge of such opening shall be splayed at an angle of not less than 60° with the horizontal.

12.03: continued

(h) Where the elevator car enclosure is not solid, except on dumb-waiters, and the openings are larger than ⅜" square, wire netting of not more than ⅜" square mesh and not smaller than No. 20 gauge wire shall cover and be securely attached to the car enclosure on the outside where (1) the counterweight passes with a clearance of less than six inches between the car enclosure and the counterweight, and where (2) there is less than four inches clearance between the car enclosure and any portion of the well construction, except at the front of the enclosure.

(i) Covers shall be installed on freight elevator cars except (1) hatchway elevators, dumb-waiters, and platform elevators installed before December 26, 1923, (2) elevators where there are automatically closing gates extending down to the floor on all landings above the lowest landing, (3) elevators with landing doors which open from the wellway side and which are only kept closed except when the car is at the landing, and (4) except on the ends of freight elevator platforms 12' long or over where there are either (a) no openings above the lowest landing, or (b) where the openings above the lowest landing are protected by automatic closing gates extending down to the floor. The covers shall be of wire grille work with a mesh not smaller than No. 9 gauge, or of other construction of equivalent strength. The covers shall be set back not more than six inches from the edge of the landing thresholds, and shall be hinged on the landing sides at such distance from the edge of the covers, not less than 18" as will permit the cover to fold back readily should it be obstructed in any manner in its descent. The cover is not required to be hinged at the opening in an outside wall, where there is no other landing opening above on the same side.

(j) There shall be a suitable emergency exit from each passenger elevator car, either by means of a trap door in the cover of the car or, in the case of elevators in battery, by doors opposite each other in the sides of two adjacent cars. For elevators installed before December 26, 1923, the opening in the dome called for in 524 CMR 12.03(2)(e) shall be considered a suitable emergency exit.

(3) Seats in Cars. Each passenger elevator for which a licensed operator is required shall be provided with a suitable seat for the operator. The seat shall be of folding type, attached to the side of the car. No other seats will be allowed in passenger elevator cars, except where there is a fixed seat installed for passengers, or where car is used for carrying an invalid or for hospital purposes.

(4) Car Gates and Doors.

(a) Power passenger elevator cars hereafter installed shall be equipped with a gate or door at each car door opening. Power passenger elevator cars installed before December 26, 1923, shall be equipped with a gate or door at each car door opening, unless (1) there is only one door opening, and unless (2) the door opening is 42" or less in width and unless (3) there is a licensed operator in charge of the car and unless (4) the car control is so located that the door opening can be protected by the operator when running the car.

(b) A power passenger elevator car having two door openings shall have the car gate or door farthest from the operator equipped with an interlocking device which shall prevent the operation of the car when the car gate or door is open. The car door at an opening for freight in a passenger elevator car need not have the interlocking device applied if the door is opened only for the occasional handling of freight and is kept locked during the use of the elevator for passenger service.

(c) The car gate or door at the door opening of a power passenger elevator car which is used without a licensed operator shall be equipped with an interlocking device which shall prevent the operation of the car when the car gate or door is open (except for private residence elevators installed before June 19, 1914, which are not of the selective automatic button control type). It shall be permissible to operate a selective automatic button control elevator with the car gate or door open if there are no passengers in the car.

(d) Freight elevator cars used for carrying more than three persons including the operator shall be either (1) enclosed on all sides to the same height as on the unused sides, leaving a door opening 42" or less in width, or (2) equipped with car gates or doors at all car openings.

12.03: continued

(e) If a freight elevator is used at stated hours for carrying employees, portable car gates or doors and enclosures may be employed at the open sides of the car, provided that all such portable construction shall be set in place and secured at all times when the elevator is used for carrying more than three persons including the operator.

(f) The open side away from the building wall of a freight elevator car located outside of a building, except a dumb-waiter, shall be protected by a hand-operated or automatic-closing bar or car gate.

(g) For elevators installed before December 26, 1923, automatic-closing car gates on freight elevators, adjacent to the outside wall of buildings, may be substituted for the filling-in of set-backs and openings in the outside wall.

(h) Car gates and doors shall, when closed, fill the openings that they protect, except that on freight elevator cars they need be only as high as the car enclosures and except where gates of different construction are specifically allowed.

(i) Car doors or gates may be solid or of open work, but shall be of such design as will reject a ball four inches in diameter, except car doors installed before June 19, 1914.

(5) Car and Counterweight Safeties and Speed Governors. (524 CMR 12.02(5)(a) and (b) and (5)(d) to (u) inclusive, do not apply to dumb-waiters.)

(a) Elevators hereafter installed suspended by cables, shall be provided with a "safety" attached to the underside of the car sling, and capable of stopping and sustaining the car with its full rated load.

(b) For rated car speeds up to and including 100' per minute on elevators hereafter installed, an instantaneous type of safety may be used for the car. For elevators hereafter installed where the rated car speed is over 100' per minute the car safety shall be of the gradual applied type designed to stop the car with its full rated load in not more than eight feet after the governor operates to apply the safety.

(c) If a counterweight of an elevator does not run to the lowest floor of a building, and the space below its lowest limit of travel is used for any purpose, the counterweight shall be equipped with a safety device which will stop the counterweight if the cables attached to it break or become slack.

(d) For elevators hereafter installed an instantaneous type of safety, if any is required, may be used for the counterweight for rated car speeds up to and including 150' per minute. For rated car speeds of over 150' per minute the counter-weight safety, where required, shall be of the gradual applied type.

(e) No "car safety" hereafter installed shall be permitted for stopping and ascending car.

(f) Car or counterweight safeties hereafter installed shall be so constructed that if applied, they cannot decrease their retarding force until the car has stopped, and so that no decrease in tension of the governor cable or motion of the car or counterweight in the descending direction shall release the safety.

(g) No "safety" hereafter installed which depends on the completion or maintenance of an electric circuit for the application of the "safety" shall be used. All safeties shall be applied mechanically.

(h) For elevators hereafter installed the gripping surfaces of car or counterweight safeties shall not be used to guide the car or counterweight.

(i) For elevators hereafter installed a pawl and ratchet or a rack rail type shall not be considered a sufficient safety device.

(j) For elevators installed after June 19, 1914, no cast iron shall be used on a car or counterweight as an operating member of a safety device, except the widing drum of a clamping safety. Car safety shoes hereafter installed shall be of steel.

(k) Passenger elevator cars hereafter installed for carrying safes or other concentrated loads shall be provided with a locking device which will hold the car at any landing independent of the hoisting cables, while the safe or other object is being loaded or unloaded.

(l) For power elevators hereafter installed except dumb-waiters, hatchway and plunger type, the car safety shall be operated by a speed governor if the car travel exceeds 15'. The counterweight safety, if any, for elevators hereafter installed, shall be operated by a speed governor if the rated car speed is over 150' per minute.

12.03: continued

(m) Speed governors where required for elevators hereafter installed having a rated car speed of 100' per minute or less shall be "set" to cause the application of the car "safety" before the speed of the descending car exceeds 175' per minute.

Speed governors for elevators hereafter installed having a rated car speed in excess of 100' per minute and not over 400' per minute shall be "set" to cause the application of the safety before the speed of the descending car exceeds the average car speed 40%.

For elevators hereafter installed having rated car speeds in excess of 400' per minute, the speed governor shall be set to cause the application of the car safety before the speed of the descending car exceeds the average car speed by 33⅓%).

For existing elevators having speed governors the governor shall be set to cause the application of the safety at a speed not exceeding 40% of the maximum car speed.

(n) The speed governor shall be located where it cannot be struck by the car or counterweight in case of overtravel.

(o) A switch shall be provided on an electric traction elevator hereafter installed, to stop the machine on or before the operation of the car safety.

(p) For hand elevators hereafter installed the car safety may be operated by the slackening or breaking of the cables.

(q) Car safeties and speed governors properly connected in such a manner that the cars shall be brought to rest with an easy and gradual stop if they attain excessive speed of descent shall be applied to power elevators installed between June 19, 1914, and December 26, 1923, operating at a rated car speed of more than 100' per minute, except plunger elevators and dumb-waiters. Car safeties and speed governors properly connected in such a manner that the cars shall be brought to rest if they attain excessive speed of descent, shall be applied to power elevators installed before June 19, 1914, and operating at a rated car speed of more than 100' per minute except plunger elevators and dumb-waiters except that an instantaneous type safety shall not be used, if the maximum car speed exceeds 350' per minute.

(r) For elevators installed before December 26, 1923, either (1) car safeties and speed governors, properly connected in such a manner that the cars shall be brought to rest if they attain excessive speed of descent, or if the car-hoisting cables become slack or break, or (2) instantaneous safety devices operated by the slackening or breaking of the car-hoisting cables, shall be applied to power elevators operating at a rated car speed of 100' per minute or less, except belt or chain-driven elevators, plunger elevators, platform elevators, hatchway elevators, dumb-waiters and sheave suspension vertical cylinder hydraulic elevators.

(s) For elevators installed before December 26, 1923, car safeties and speed governors, properly connected in such a manner that the cars shall be brought to rest if they attain excessive speed of descent, or if the cables become slack or break, shall be applied to power elevators of the belt or chain-driven type which operate at a rated car speed of 100' per minute or less and have a travel of more than 40', except platform elevators, hatchway elevators, and dumb-waiters, and except power elevators of the belt or chain-driven type installed before June 19, 1914, which have a rated car speed of less than 60' per minute.

(t) For elevators installed before December 26, 1923, car safeties and speed governors properly connected in such a manner that the cars shall be brought to rest if they attain excessive speed of descent or if the cables become slack or break, shall be applied to sheave suspension vertical cylinder hydraulic type elevators operating at a rated car speed of 100' per minute or less and having a travel of over 15'.

(u) Power passenger elevator cars installed since June 19, 1914, shall have the safeties specified in 524 CMR 12.03(5)(q), (r), (s), and (t) located below the car bottom.

12.04: Machines and Machinery

(1) General Design. (524 CMR 12.04(1)(c) does not apply to dumb-waiters, or to elevators installed before June 19, 1914.)

(a) Drums and sheaves for power elevators hereafter installed shall be of cast iron or steel, and shall have finished grooves.

(b) Set screw fastenings shall not be used in lieu of keys or pins on elevator machines hereafter installed.

12.04: continued

(c) A friction gearing or clutch mechanism which is an integral part of the machine shall not be used to operate the widing drum or sheaves of any elevator, except in connection with a car levelling device.

(d) For power elevators hereafter installed, except dumb-waiters and except existing elevator machines moved to a new location, cast iron teeth in worm gearing are prohibited.

(e) Gears operating traction sheaves and widing drums when so located as to be dangerous in the opinion of the inspector having jurisdiction, shall be enclosed by suitable guards.

(f) The diameter if driving sheaves and drums for power elevators hereafter installed, except dumb-waiters, shall not be less than 38 times the diameter of the cables.

(g) All parts of the installation shall be constructed to permit of proper lubrication.

(2) Belt and Chain-driven Machines. (524 CMR 12.04(2)(a) and (e) do not apply to elevators installed before June 19, 1914. 524 CMR 12.04(2)(b), (c) and (d) do not apply to dumb-waiters).

(a) Belt and chain-driven machines shall not be used for passenger elevators.

(b) Single belted elevator machines shall not be installed after December 26, 1923. Chain driven elevators shall not be installed after December 26, 1923, unless they are provided with an electric brake and with terminal stops as called for in Regulation 2 of Section 6, and unless the capacity is not over 2,500 lbs., the speed not over 40' per minute, and the travel not over 40'.

(c) Double belted elevator machines hereafter installed will be permitted only when driven from a line shafting which also supplied power for other purposes, except when driven by an individual motor and provided with an electric brake and with terminal stops as called for in Regulation 2 of Section 6.

(d) Belt driven elevator machines hereafter installed shall be operated at a rate car speed not in excess of 60' per minute.

(e) Means shall be provided to stop the driving belts of a double belted elevator machine without stopping other machinery driven from the same source of power.

(f) Belt or chain-driven machines installed before June 19, 1914, may be used for passenger elevators if the rated car speed is 100' per minute or less. Elevator machines operated by reversing steam engine constructed as a unit with the elevator machine and direct belted thereto, installed previous to June 19, 1914, may be used for passenger service at rated car speeds not exceeding 250' per minute.

(g) Elevator belts, except within machine enclosures, which come within seven feet of the floor, shall be properly guarded.

(3) Hydraulic Machines and Tanks. (524 CMR 12.04(3) (a), through (d), (h), (k), (l), through (s), (v) and (x) do not apply to elevators installed before June 19, 1914).

(a) The piston rod in tension of hydraulic elevators of the sheave type shall have a minimum factor of safety of eight, figured on the cross-sectional area at bottom threads.

(b) Hydraulic elevator machines, except dumb-waiters, shall be equipped with piston travel-limit numbers or stops, and shall be constructed of such strength that when the full water pressure is applied the piston will be stopped by this means before the car can be drawn into the overhead work.

(c) Metal guides shall be provided for the sheave suspension yoke of vertical sheave suspension type hydraulic elevators, except dumb-waiters.

(d) The valve chambers and cylinders of hydraulic elevators shall be provided with means for removing air.

(e) The traveling sheaves of vertical cylinder hydraulic elevators shall be attached with two part iron or steel hangers and not with U straps.

(f) The discharge tanks of hydraulic elevators shall be covered to prevent dirt and material falling into them.

(g) Such discharge tanks shall be vented so as to be open to atmospheric pressure.

(h) The pressure tanks for hydraulic elevators shall be built of either flanged or boiler steel or fire-box steel or extra soft steel, or wrought iron, the properties of which shall conform to the requirements of the Air Tank Regulations prescribed by the Massachusetts Board of Boiler Rules.

12.04: continued

(i) The maximum pressure to be allowed on pressure tanks for hydraulic elevators shall be determined by the formula stated in 522 CMR 7.00 (Air Tank Regulations). The factor of safety in the above formula is to be the lowest factor of safety allowed by 524 CMR 12.04(3)(j). The tensile strength used in the above formula shall be the tensile strength stamped on the plates by the manufacturer, or if not so stamped, shall be taken as 45,000 lbs. for wrought iron and 55,000 lbs. of steel.
(j) The lowest factor of safety to be used for the pressure tanks for hydraulic elevators shall be four, if the longitudinal joints are of butt and double-strap construction. A factor of safety of not less than five shall be used for elevators installed before June 19, 1914, if the longitudinal joints are of lap construction.
(k) The longitudinal joints of the shell of pressure tanks for hydraulic elevators may be of lap-riveted construction if the diameter of the shell does not exceed 36", but in such cases the maximum pressure to be allowed on the tank shall be 125 lbs. per square inch.

(m) The minimum thickness of shell plates shall be as follows:

Diameter of Shell	Minimum Thickness of Shell Plate
36" or less	5/16"
Over 36" up to and including 54"	¾"
Over 54" up to and including 72"	7/16"
Over 72"	9/16"

(n) Openings for threaded connections one inch and over, in pressure tanks for hydraulic elevators, shall be reinforced.
(o) The minimum thickness of the bumped heads shall be determined in accordance with the formulas for bumped heads in 522 CMR 7.00 (Air Tank Regulations). The factor of safety in these formulas shall be five, and the tensile strength shall be the tensile strength stamped on the plates by the manufacturer, or, if not so stamped, shall be taken as 45,000 lbs. for wrought iron and 55,000 lbs. for steel.
(p) When a bumped head has a manhole opening, the thickness as found by the formulas referred to in Regulation 30, shall be increased by not less than ⅛" and the flange shall be turned inward to a depth not less than three times the thickness of the head.
(q) No cast iron heads of flat stayed heads shall be used.
(r) Pressure tanks for hydraulic elevators, if 30" in diameter or less, shall be provided with two 4" x 6" handholes located one in each head or in the shell as near each head as practicable.
(s) Pressure tanks for hydraulic elevators, if over 30" in diameter, shall be provided with an 11" x 15" manhole.
(t) Every pressure tank for hydraulic elevators shall have a pressure gage connected to the tank by a brass or other non-corrosive pipe, and in such manner that the pressure gage cannot be shut off from the tank, except by a cock with a T or lever handle placed on the pipe near the pressure gage. The dial of the pressure gage shall be graduated to not less than 1½ times the maximum pressure allowed on the tank.
(u) Every tank for hydraulic elevators shall be provided with a ½" pipe size connection for attaching inspector's test gage when the tank is in service, so that the accuracy of the pressure gage can be ascertained.
(v) Pressure tanks for hydraulic elevators shall be tested before being put in use with a hydrostatic pressure 50% in excess of the maximum working pressure for which the tank is constructed. (The hydrostatic test may be made in the shop of the manufacturer.)

12.04: continued

(w) Pressure tank for hydraulic elevators shall be provided with water gage glasses, connected with brass pipe and fittings and indicating the height of the water in the tank. (The water level in the tank should generally be maintained at about ⅔ of the height of the tank).

(x) Pressure tanks for hydraulic elevators shall be so located and supported that they can be inspected on all sides and ends.

(4) Pumps and Pump Regulators. (524 CMR 12.04(4)(b) and (d) do not apply to elevators installed before June 19, 1914.)

(a) Every pump connected with the pressure tank of an hydraulic elevator shall be equipped with a water-relief valve or valves.

(b) The size of the relief valve shall be not less than the following, except that two or more valves may be used to give the required area:

Size of Diameter of Discharge Opening of Pump	Relief Valve
2" or less	1"
2½"	1½"
3"	1½"
3½"	2"
4"	2"
4½"	2½"
5"	2½"
6"	3"
7"	3"
8"	3"
9"	3½"
10"	4"
12"	4"
14" O.D.	5"
15" O.D.	5"
16" O.D.	5"

(c) The valves shall be set to discharge at a pressure not greater than the safe working pressure for the tank, and shall be installed so that they cannot be shut off from the pump.

(d) The relief valves may be piped to discharge into the discharge tank or into the pump suction.

(e) Steam pumps for hydraulic elevators shall be provided and operated with pressure regulating valves controlling the steam to the pumps, and electric-driven pumps for hydraulic elevators shall be equipped with automatic pressure regulating valves controlling the motor, or with automatic by-passes.

(5) Hand Elevator Machines.

(a) Hand elevators hereafter installed shall be equipped with a brake that operates to stop the machine in either direction. When the brake has been applied, it shall remain locked in the one position until released.

(b) No hand elevator machine shall be equipped with any means or attachment for applying any other power, unless such elevator is permanently and completely converted into a power elevator complying with all the requirements for power elevators.

(c) Power shall not be applied to hand elevators by means of rope grip attachments or clutch mechanisms.

(d) The minimum carrying capacity of hand passenger elevators hereafter installed shall be 50 lb. per square foot of platform area inside of the car enclosure.

(6) Electric Brakes.

(a) Electric brakes shall be installed on electric elevators hereafter installed, and on all electric elevators installed after June 19, 1914, which have a speed of over 100' per minute.

12.04: continued

(b) Every direct current elevator controller operating a brake magnet shall provide a means for handling the shunt winding of the brake magnet in such a way that the brake will not be retarded in its action by motor field discharge.

(7) Enclosures around Machines.

(a) Elevator machines located on the floor shall be enclosed by solid partitions or grille work not less than four feet high. The mesh or grille work shall be such as to reject a ball two inches in diameter. (If the elevator machine is located in an engine room or pump room, etc., used exclusively as such, the enclosures are not required, but such protection as is required for fly-wheels, belted apparatus and other machinery should be provided.)

(b) Partitions, guards and head room around elevator machines shall be so located as to make all parts of the machines properly accessible for inspection and care. For elevators installed before June 19, 1914, reasonable access shall be provided where practicable.

12.05: Cables

(1) Hoisting and Governor Cables.

(a) Car and counterweight hoisting cables, except for dumb-waiters, shall be of iron or steel without covering, except that Marlin covered cables may be used where liability to excessive corrosion or other hazard exists. (524 CMR 12.05 does not apply to the hoisting cables of traction freight elevators installed before June 19, 1914, where the hoisting power is obtained by the traction between the hoisting cables and the sheaves.)

(b) The minimum factor of safety of car and counterweight hoisting cables for elevators installed before December 26, 1923, except those of dumb-waiters, shall be six based on the suspended load. The ultimate strength of the cables shall be based on the cable manufacturer's lists.

(c) The factor of safety based on static loads for car and counterweight cables for power elevators hereafter installed, except dumb-waiters, shall be not less than the values given in Figure One, corresponding to the rated car speed.

The number and diameter of the cables for elevators hereafter installed, except dumb-waiters, shall be determined by using the factor of safety given in Figure One, together with the ultimate strength of the cable. The computed load on the cables shall be the weight of the car, plus its rated load, plus the weight of the hoisting cables and compensations, if any. For power elevators hereafter installed, except dumb-waiters, cables having a diameter of less than ⅜" shall not be used. The minimum factor of safety of all car and counterweight hoisting cables for hand elevators hereafter installed shall be five based on the suspended load.

(d) Elevator cars and counterweights shall have not less than two hoisting cables each, except (1) on dumb-waiters, (2) on hand freight elevators having a lifting capacity of 500 lb. or less, (3) on the counterweights of freight elevators installed before December 26, 1923, where the counterweight does not weigh more than 1,400 lb., (4) on the counterweights of elevators installed before June 19, 1914, where there is only one existing cable and the elevator is not used for carrying more than two passengers other than the operator, and (6) for traction type elevators hereafter installed.

(e) Power traction machines hereafter installed, except dumb-waiters, shall have not less than four cables if the rated capacity exceeds 1,000 lb., and not less than three cables if the rated capacity is 1,000 lb. or less.

(f) No car or counterweight cable, whether new or used, shall be extended or repaired by splicing another piece of cable to it.

(g) For winding drum-type machines, there shall be not less than one full turn of each car-hoisting cable on the drum when the car has reached the lower limit of travel, and not less than one full turn of each counterweight-hoisting cable on the drum when the counterweight has reached its lower limit of travel.

(h) The drum ends of the car and counterweight-hoisting cables shall be secured by clamps or by tapered sockets.

12.05: continued

(i) The car and counterweight ends of cables, except that such fastening is not required for dumb-waiters or for the compensating counterweight cables of plunger elevators, shall be fastened by spliced eyes, or by passing through independent tapered and leaded sockets. The length of socket shall be not less than four times the diameter of the cable. The hole at the small end of the socket shall be not more than 1/16" larger than the diameter of the cable. After passing through the socket the strands shall be separated and turned into the center, the length of the turned-in portion being not less than 2½ times the diameter of the cable. The knot shall be drawn tightly into the socket and poured with zinc or babbitt. The socket shall be of drop forging or steel casting, not cast iron, and shall be of sufficient strength to break the cable before the socket gives any indication of distress.

(j) On elevators installed before December 26, 1923, except dumb-waiters, equalizers shall be installed at connections to cars of hoisting cables where practicable.

Cable equalizers or self-adjusting cable hitches shall be provided at the car or counterweight ends of all hoisting cables for traction-type elevators hereafter installed, except dumb-waiters. Equalizers may be of the compression spring type for traction elevators.

Cable equalizers shall be provided at the car ends of overhead winding drum type machines hereafter installed, except dumb-waiters, if the cables wind in right and left hand grooves on the drum.

(k) Car counterweight cables shall be fastened independent of hoist cable fastener.

(l) On horizontal hydraulic machines there shall be at least ten feet between anchorage and sheaves. If this cannot be obtained, cable ends shall be secured with unleaded knots.

(m) The car and counterweight cables shall be installed in such a manner that the car and counterweight shall, respectively be brought to rest on the buffers before the counterweight or car strikes any part of the overhead structure.

(n) Governor and safety cables for elevators hereafter installed shall be of steel, iron, or phosphor bronze not less than ⅜" in diameter. Iron tiller rope shall not be used for governor cables.

(o) Periodic Resocketing of Babbitted Rope Sockets of Car Hoisting Ropes on Winding-Drum Driving Machines. Requirements for same shall be as specified in 524 CMR 17.26(19).

(2) Shipper Ropes, Rope Locks and Controlling Devices. (524 CMR 12.05(2)(b) and (d) do not apply to elevators installed before June 19, 1914.)

(a) No elevator hereafter installed traveling at a rated car speed exceeding 100' per minute shall be controlled by a hand-operated shipping cable. Elevators installed before December 26, 1923, may be operated by hand-operated shipping cables if the rated car speed does not exceed 150' per minute.

(b) No elevator hereafter installed traveling at a rated car speed exceeding 100' per minute, except a hydraulic elevator, shall be controlled by a shipping cable operated by wheel or lever mechanism. No elevator installed before December 26, 1923, except hydraulic, shall be controlled by a shipping cable operated by wheel or lever mechanism if the rated car speed exceeds 150' per minute.

(c) The overhead tension weights of shipping cables shall be equipped with safety chains of not less than No. 7 wire, securely fastened to the weight and to anchorage.

(d) Shipper ropes shall be so located as to be inaccessible from landing openings in outside walls of buildings.

(e) Shipper ropes on electric elevators shall be grounded.

(f) Power freight elevators controlled by shipper ropes, except dumb-waiters, shall be provided with shipper rope-locks, so arranged that the cars can be locked at each landing.

(g) Electric power elevators hereafter installed, except dumb-waiters, controlled by hand-operated shipping cables shall have the controlling device so arranged that, in case of failure of power, it will be necessary to return the controlling device to the off position before the elevator can be started again.

12.05: continued

(h) Power freight elevators controlled by shipper ropes, except dumb-waiters, shall be provided, where practicable, with centering ropes or bridles to stop the cars at any part of their travel. The centering ropes shall be attached to the shipper directly under the upper sheaves.

12.06: Counterweights, Guide Rails and Bumpers

(1) Counterweight Construction. Counterweights shall have their sections securely bolted or strapped together to keep the individual or subweights in position. Rods passing through the counterweights shall be provided with double nuts, and the ends of the rods, outside of nuts, are to be riveted over or provided with cotter pins. Car counterweights, when provided, shall be suspended above the machine or drum counterweight.

(2) Car and Counterweight Guide Rails. (524 CMR 12.06(2)(a), through (d), (f), (g), (i) and (j) do not apply to elevators installed before June 19, 1914.)

(a) Counterweights of power elevators shall run in guide rails.

(b) For elevators hereafter installed, and for those installed before December 26, 1923, except dumb-waiters, having rated car speed exceeding 100' per minute, car and counter-weight guide rails shall be of steel. Wood guide rails may be used for elevators hereafter installed having a travel of not more than 100' and operating at a rated speed not in excess of 100' per minute. When the use of steel rails presents an accident hazard, as in chemical or explosive factories, wood guide rails may be used.

(c) The weight of steel guide rails shall not be less than given in the following table:

Total Weight of Car and Load, Total Weight of Counterweights per Pair of Rails (Pounds)		Minimum Weight of Each Car Guide Rail (Pounds per Lineal Foot)	Minimum Weight of Each Counterweight Guide Rail (Pounds per Lineal Foot)		
Above ---	To and Including ___		With Guide Rail Safeties	Without Guide Rail Safeties	
				1 to 1 Roping	2 to 1 Roping
-	4,000	6½	6½	6½	6½
4,000	6,000	11	6½	6½	6½
6,000	15,000	14	14	6½	6½
15,000	40,000	30	30	14	14

(d) Steel guide rails shall be tongued and grooved and secured with plates at joints, or the joints otherwise equally secured so as to be free from motion in any direction.

(e) The size of wooden car-guide rails, except for dumb-waiters, shall not be less than given in the following table, for power elevators and for hand elevators installed before June 19, 1914, which are not used for more than two passengers other than the operator, and except in the case of a plunger elevator installed before June 19, 1914, the guides of which are not used in connection with a safety device.

Total Weight of Car and Load per Pair of Maple Guide Rails (Pounds)		Size of Each Guide Strip in Inches
Above ___	To and Including ___	
—	5,000	2 x 2½
5,000	8,000	2½ x 3
8,000	12,000	3 x 4
12,000	16,000	4 x 5

12.06: continued

(f) Guide strips of wooden car guide rails shall be made of maple or other suitable hard wood, and shall be securely mounted on substantial posts.

(g) Guide rails for cars and counterweights shall extend to the bottom of the pit and to the overhead beams, and shall be strongly fastened in place.

(h) Steel guide rails shall be securely fastened with iron or steel brackets or such strength, design and spacing that the guide rails and their fastenings will not deflect unduly under normal operation or when the safety operates to stop the fully loaded car or counterweight. Steel guide rails and their fastenings hereafter installed shall be secured in position by clips or through bolts of not less than the following sizes:

6½ pound rails, ½" bolts.
11 and 14 pound rails, ⅝" bolts.
30 pound rails, ¾" bolts.

(i) The size of wooden car guide rails for hand elevators having a capacity not exceeding 3,000 lb. except dumb-waiters, shall be not less than 1¾" across the gripping face, and not less than 1¼" thick.

(j) Cast iron guide rails shall not be used for elevator cars or counterweights.

(3) Bumpers. (524 CMR 12.06(3) does not apply to dumb-waiters. 524 CMR 12.06(3)(b), (c), (d) and (f) do not apply to elevators installed before June 19, 1914.).

(a) Car bumpers shall be installed in elevator pits so as to leave a clear space of not less than 12" between the floor of the pit and the under side of the car sling when the elevator car rests on the bumpers, except for dumb-waiters and platform elevators installed before December 26, 1923, and except where not practicable for elevators installed before June 19, 1914.

(b) Spring bumpers of their equivalent shall be used for elevators hereafter installed having a rated car speed of more than 100' and not exceeding 400' per minute. Elevators installed before December 26, 1923, shall be equipped with spring buffers if the rated car speed exceeds 150' per minute. Oil buffers or their equivalent shall be used with elevators hereafter installed having a rated car speed greater than 400' per minute.

(c) Bumpers or buffers hereafter installed shall be located symmetrically with reference to the center of the car.

(d) Adequate provision in the design of plunger elevators shall be made to stop the plunger as well as the car.

(e) Counterweight bumpers or buffers similar to those required for cars shall be installed under the counterweights of elevators hereafter installed, and for existing elevators which do not turn to the lowest floor of the building, when the space below their lowest limit of travel is used for any purpose.

(f) Oil buffers or their equivalent, for an elevator the rated car speed of which exceeds 400' per minute shall be of such design and construction as to absorb within the limits of the moving parts of the bumpers, all the energy of the counterweight or car loaded to its full capacity descending at governor tripping speed.

12.07: Controlling Devices and Terminal Stops

(1) Machine Slack Cable Safety Devices. (524 CMR 12.07(1)(b) and (c) do not apply to elevators installed before June 19, 1914.)

(a) Slack cable devices which will stop the elevator machines if the hoisting cables slacken or break, shall be provided on winding drum power elevators having a travel of over 15', except freight elevators installed before June 19, 1914, in which the machines are located above the upper landing and which are not used for carrying more than two passengers besides the operator.

(b) In the case of selective automatic button-control elevators, the slack cable safety device shall break the car stop-button circuit.

(c) Slack cable devices which will stop the elevator machines if the hoisting cables slacken or break, shall be provided on winding drum power dumb-waiters having a travel of over 30' and a capacity of over 100 lb., and serving more than two landings.

12.07: continued

(2) Terminal Stops. (524 CMR 12.07(2)(b) to (h), inclusive, do not apply to dumb-waiters.)

(a) Power elevators except traction elevators, and except plunger elevators having a travel of 30' or less or having a speed of less than 150' per minute, shall be equipped with adjustable machine automatic terminal stop mechanisms set to stop the machines if the cars or counterweights pass 18" above their upper limits of normal travel, or exceeding one-half the over-travel space when this space is less than three feet.

Automatic stop valves on hydraulic machines are included as machine automatic terminal stop mechanisms, and must be arranged to allow the machine to always start the car away from the terminal landings at normal speed.

(b) No chain or rope-driven machine automatic terminal stop mechanisms on winding drum type machines shall be allowed, except for freight elevators installed before June 19, 1914. 524 CMR 12.00 is not to be construed to prevent the use of a chain or rope driven elevator machine automatic terminal stop mechanism as a secondary safety device, provided that the machine automatic terminal stop mechanism in accordance with 524 CMR is installed and kept in proper condition and adjustment.

(c) Traction type electric power elevators of the car switch or button-control type shall be equipped with car or shaftway limit switches operated directly by the car, and connected to automatically slow down and stop the car:--(1) before it passes 18" above the top terminal landing, or not exceeding one-half the over-travel space when this space is less than three feet, and (2) not less than two inches before the car strikes the buffers in the pit, except that where car and counterweight oil buffers are provided, the limit switches may be arranged to stop the car two inches before the car and counterweight buffers are fully compressed.

A final stop shaftway limit switch shall be installed at the top and bottom of the shaftway, operated directly by the car if it passes beyond the limits of travel specified above, and connected to open the circuit of either (a) a main line circuit switch on the controller, independent of the car control switch or button or (b) two or more solenoid switches controlled by the car control switch or button, two of which must be closed to complete the motor circuit in each direction of travel, provided this limit switch is connected into the control circuit on the opposite side of the magnet winding from the car control switch or button.

Traction type electric power elevators having shipper rope control shall be equipped with final stop car or shaftway limit switches at the top and bottom of the shaftway operated directly by the car, and connected to open the circuit of a main line circuit switch if the car passes more than 18" above the top terminal landing, or exceeding one-half the overtravel space when this space is less than three feet and not less than two inches before the car strikes the buffers in the pit.

(d) All winding drum type electric elevators of the car switch or button-control type hereafter installed shall be equipped with shaftway limit switches operated directly by the car, and connected to automatically slow down and stop the car:--(1) before it passes 18" above the top terminal landing or not exceeding ½ the over travel space when this space is less than three feet and (2) not less than two inches before the car strikes the buffers in the pit.

Final stop shaftway limit switches shall be installed at the top of the shaftway operated directly by the car and counterweight and at the bottom of the shaft operated directly by the cars and arranged to stop the machine (a) if the cars or counterweights pass 18" above the upper limits of normal travel, or exceeding ½ the over travel space when this space is less than three feet and (b) before the car strikes the buffers in the pit. The final stop shaftway limit switches and the machine automatic terminal stop mechanism shall be connected to open the circuit of either (a) a main line circuit switch on the controller independent of the car control switch or button, or (b) two or more solenoid switches controlled by the car control switch or button, two of which must be closed to complete the motor circuit in each direction of travel, provided they are connected into the control circuit on the opposite side of the magnet winding from the car control switch or button.

12.07: continued

(e) Existing winding drum type machines of the car switch or button-control type shall either have terminal stops arranged as called for in 524 CMR 12.07(2)(a) and (d), or they shall have the machine automatic terminal stop mechanism arranged to slow down and stop the machine before the cars or counterweights pass 18" above their upper limits of normal travel, or not exceeding ½ the overtravel space when this space is less than three feet provided they are also equipped with final stop shaftway limit switches operated respectively by the car and counterweights as they pass their upper limits of normal travel and arranged to stop the machines if the cars or counterweights pass 18" above the upper limits of normal travel, or exceeding ½ the over travel space when this space is less than three feet.

A well limit switch may control, together with the car control switch or button, a single solenoid in the armature circuit only if the armature and brake circuits are positively opened by the machine automatic terminal stop mechanism. A well limit switch may control, together with the car control switch or car control button, two or more solenoid switch or solenoid switches as the car control switch or car-control button, it shall be connected into the control circuit on the opposite side of the magnet windings from the car control switch or car control button.

(f) Winding drum type electric elevators hereafter installed operated by two or three phase alternating current shall have the machine automatic terminal stop mechanism arranged to directly open the main line circuit to the motor and brake if the car or counterweights pass 18" above their upper limits of normal travel or exceeding ½ the overtravel space when this space is less than three feet.

(g) Direct current winding drum type electric elevators hereafter installed having shipper rope control, and all alternating current winding drum type electric power elevators having shipper rope control, shall be equipped with final stop shaftway limit switches operated directly by the car and counterweight and connected to open the circuit of a main line circuit switch if the car or counterweights pass 18" above the upper limits or normal travel or exceeding ½ the overtravel space if this space is less than three feet.

(h) Electric elevators operated by polyphase alternating current motors shall be provided with relays of the potential type which will prevent the starting of the motor if (a) the phase rotation is in the wrong direction, or (b) there is a failure of any phase.

(i) Elevators having shipper rope control shall be equipped with adjustable ball stops, adjusted to stop the cars within six inches of the upper and lower landings.

(j) Hatchway and car limit switches hereafter installed shall be enclosed and shall be heavy design and construction securely mounted in such a manner that the movement of the switch roller to open the contacts shall be in a direction as nearly as possible at right angles to a line drawn between the face of the car guide rails. The cam or cams for opening the limit switches shall be of iron or steel securely fastened so that they cannot move out of place.

(k) The main line circuit switch referred to in 524 CMR 12.07(2)(c), (d), and (g) shall be of the multi-pole type when two or three phase alternating current is used.

(3) Electric Car Switches. Electric car control switches shall be so constructed as to return automatically to their off position upon the removal of the hand of the operator, and shall lock automatically in the "off" position.

(4) Emergency Car Switch. (524 CMR 12.07(4) does not apply to elevators installed before June 19, 1914.)

(a) An emergency switch or stop button shall be installed in every elevator car of an electric power elevator, except dumb-waiters, elevators operating through automatic hatch doors, and elevators having shipper rope control installed before December 26, 1923.

(b) Such emergency switch or "stop-button" shall be connected to open the circuit of a main line circuit switch independent of the car control device and shall be connected by a cable independent of the car-control cable and of opposite polarity.

12.07: continued

(5) Overload Circuit Breakers. If an overload circuit breaking device is used for an electric elevator operated by direct current, it must be arranged to open the circuit of the brake magnet coil winding at the same time that the line circuit is opened.

(6) Grounding Machine Frames. The frames of electric elevator machines shall be grounded.

(7) Voltage of Control Circuit and Fuse Substitution.
(a) No difference of potential in excess of 250 volts shall be permitted in any car-switch or button-control circuit.
(b) No wire or other current carrying device shall be substituted for the proper fuse or circuit breakers in an elevator circuit.

(8) Switchboards, panelboards, and contact supports shall be of moisture-resistant and noncombustible material.

12.08: Miscellaneous

(1) Warning Chains on Freight Cars.
(a) Warning chains shall be suspended from the car sills of power freight elevator cars, except those of dumb-waiters and hatchway elevators and except those with landing doors opening only from the shaftway, or when the landing gates are not less than six feet high.
(b) The warning chains shall be not less than 30" long, shall be made of No. 0 coil, No. 7 wire gage, and shall be set not more than six inches on centers, and secured to wood sills or cleats by staples one inch long. (The chains are required to be attached with one inch staples to wood so that, if caught, they will pull out before causing serious damage.)

(2) Change in Use of Elevator. Before a material change in the use of an elevator is made, the party making such change shall give notice thereof, in writing, to the department having jurisdiction. (The object of 524 CMR 12.08 is to prevent the improper use of elevators between regular inspections. A material change includes any change that would require a change in the elevator installation, such as the use of freight elevator for passenger service or for carrying help to and from work, in which case additional safeguards are required, or the use for hoisting automobiles of an elevator originally designed for hoisting carriages, in which case the capacity of the elevator might be exceeded.)

(3) Capacity and Speed. (524 CMR 12.08(3)(a) (b) (c) and (d) do not apply to elevators installed before June 19, 1914.)
(a) The minimum carrying capacity of a power passenger elevator shall be 75 lbs. per square foot of car platform area inside of the car enclosure, except a hospital elevator arranged to carry a cot or stretcher, and except a private residence elevator, in which cases the minimum carrying capacity shall be 50 lbs. per square foot of car platform area inside of the car enclosure. (Hospital elevators of the direct-plunger type need not have a capacity exceeding 1,000 lbs., even if the size of the car is such as to require a greater capacity on the basis of 50 lbs. 75 lbs. per square foot.)
(b) There shall be a metal capacity plate located by the elevator manufacturer in a conspicuous place in each elevator car, except dumb-waiters, on which plate shall be the word "Capacity" in letters not less than ¼" high, followed by figures and letters not less than ¼" high designating the normal rated lifting capacity of the elevator in pounds and speed of the elevator in feet per minutes.
(c) The rated speed of any elevator shall not exceed 600' per minute, except that express elevators may be run at a rated speed not exceeding 700' per minute for that portion of the shaft in which no landing stops are made. Express elevators shall mean only such elevators as run 80' or more without a stop.
(d) The speed of platform elevators installed before December 26, 1923, and of hatchway elevators shall not exceed 55' per minute.
(e) The minimum carrying capacity of hand passenger elevators hereafter installed shall be 50 lbs. per square foot of platform area inside of the car enclosure.

12.08: continued

(4) Lighting.

(a) Every passenger elevator car, when in use, shall be properly lighted by an electric or gas light in the car at such times as there is insufficient natural light. Light globes and fixtures shall be so protected as to prevent them from falling. (Gas lighting shall be used only when electricity is not available in the building.)

(b) Every freight elevator car, when in use, except cars of hatchway elevators and dumb-waiters, shall be properly lighted by electricity or gas at such times as there is insufficient natural light. Lights may be located in or adjacent to the shaftways if they light the car properly throughout its entire travel, or the light may be located in the car. (Gas lighting in the cars shall be used only when electricity for lighting is not available in the building.)

(c) There shall be electric or gas lighting at each story near hatchway and platform elevators installed before December 26, 1923, so arranged as to illuminate the car and its approaches properly. If there is a tight enclosure around the elevator, sufficient lights shall be located inside the shaftway.

(d) Every elevator machine room shall be provided with a suitable electric or gas light which can be lighted without passing over or reaching over any part of the machinery.

(5) Signals.

(a) An annunciator or other signal system, operated from each landing and indicating from which landing the call originates, shall be installed in every passenger elevator car except in private residence elevator cars and except in cars which have no licensed operators.

(b) There shall be a bell located in every power freight elevator or in the shaftway where it may be heard on all floors, arranged to be operated from each landing opening. 524 CMR 12.08 does not apply to dumb-waiters, to elevators serving only two adjacent stories, to elevators equipped with an annunciator or other signal system such as required in Regulation 5a.

(c) Every hatchway elevator car where sliding hatch covers are used shall be equipped with a gong which shall ring at least twice as the car passes through each story. The gong shall be plainly audible above the street noises and noises due to machinery or work in the building.

(d) The gong shall be installed on any type hatchway elevator if the operation of the hatch covers does not make sufficient noise to give warning of the approach of the car.

(e) Every passenger elevator which has no licensed operator shall be provided with an emergency call bell operated from the car and located outside the shaftway.

12.09: Sidewalk Elevators

(1) Protection of Openings. The opening of a sidewalk elevator landing within the line of any sidewalk or passageway open to the public shall be protected by substantial guards before the elevator is started, the lower rail of which shall not be less than 18" high, and the upper rail not less than 30" high. These guards shall be securely held in place when the elevator is in use.

(2) Hatch Covers.

(a) If the shaftway is located outside the building or in a passageway open to the public, it shall be provided with a lifting cover of the automatic self-closing type operated by substantial brackets not less than six feet high, placed on the elevator platform.

(b) For elevators hereafter installed, hinged hatch covers shall not be used on sidewalk openings.

(c) Hatchway covers of sidewalk elevators shall be of sufficient strength to safely carry a uniformly distributed live load of 250 lb. per square foot, or a concentrated load of 8,000 lb., whichever load gives the higher stresses.

(d) Vertical lifting hatch covers shall not be used as a thoroughfare or passage unless there is a clear space above the cover, when at the top of its travel, or not less than two feet.

(3) Shaftway Enclosures and Gates. (524 CMR 12.09(3)(c) does not apply to elevators installed before June 19, 1914.)

12.09: continued

(a) If the shaftway is located outside the building and the elevator serves only one story below the street level, the lower story shall be enclosed on the unused sides with guards not less than three feet four inches above the floor, securely fastened in place.
(b) The landing openings in the enclosures or guards around the shaftway at the bottom landing of a sidewalk elevator serving only two adjacent stories, shall be protected by a hand-operated bar, gate or chain, if an automatic gate is not installed.
(c) If the shaftway is located inside the building or serves more than one story below the street, the shaftway enclosure and landing gates shall be the same as required for freight elevators, except that the top of the gate at the sidewalk opening need be only three feet four inches high above the sill.

(4) Clearance between Cover Frame and Platform. For elevators hereafter installed, the clearance between the sidewalk cover frame and the elevator platform shall not exceed two inches.

(5) Car Enclosures. For elevators hereafter installed when the elevator shaftway is located inside the building the platform shall be enclosed on the unused sides with solid enclosures not less than six feet high. Enclosures may be wood or metal.

(6) Guards around Machinery.
(a) Suitable guards not less than four feet high shall be placed around the machinery of power elevators.
(b) Gears, operating winding drums or sheaves of sidewalk type elevators so located as to be dangerous in the opinion of the inspector having jurisdiction, shall be enclosed by suitable guards.
(c) Partitions, guards and head room around sidewalk elevator machines shall be so located as to make all parts of the machines properly accessible for inspection and care. For elevators installed before June 19, 1914, reasonable access shall be provided where practicable.

(7) Machines. Belt, chain-driven and friction machines shall not be used for power sidewalk elevators hereafter installed.

(8) Hoist Cables.
(a) Hoisting cables or chains for sidewalk elevators shall be of iron or steel, and shall have a factor of safety of six based on the suspended load.
(b) There shall be not less than one full turn of each hoisting cable on the winding drum of a sidewalk elevator when the car is at the lowest limit of travel.
(c) The drum ends of the hoist cables or chains shall be secured by clamps or tapered sockets.
(d) The car ends of hoist cables shall be fastened by spliced eye or tapered sockets. Car ends of hoist chains shall be fastened by "U" bolts provided with lock nuts and cotter pins or other suitable fastenings.

(9) Operating Cables. (524 CMR 12.09(9)(a) does not apply to elevators installed before June 19, 1914.)
(a) Shipper ropes or chains shall be so located as to be inaccessible from street opening or landing opening in outside wall of building when elevator is not at the sidewalk level.
(b) Shipper ropes or chains of electric sidewalk elevators shall be grounded.

(10) Guide Rails. Car guide rails for power sidewalk elevators hereafter installed shall be of steel, and shall weigh not less than seven pounds per lineal foot. They shall be securely fastened with iron or steel brackets, and shall be tongued and grooved or dowelled, and secured with plates at joints or the joints otherwise equally secured so as to be free from motion in any direction.

12.09: continued

(11) Terminal Stops.

(a) Power driven sidewalk elevators, except plunger type and traction type, shall be equipped with adjustable machine automatic terminal stop mechanisms, set to stop the machinery at the upper and lower limits of normal travel. No chain or rope driven machine automatic terminal stop mechanism on widing drum type machines shall be allowed, except for sidewalk elevators installed before June 19, 1914.

(b) Elevators having shipper-rope control shall be equipped with adjustable ball stops, adjusted to stop the cars within six inches of the upper and lower landings.

(12) Reverse Phase Relay and Main Line Circuit Switch.

(a) Electric sidewalk elevators operated by polyphase alternating current motors shall be provided with relays of the potential type which will not permit the starting of the motor if (1) the phase rotation is in the wrong direction, or (2) when there is a failure of any phase.

(b) Electric sidewalk elevators hereafter installed shall be provided with a main line circuit switch.

(13) Electric Brakes. Electric sidewalk elevators hereafter installed shall be provided with electric brakes.

(14) Pits and Bumpers.

(a) For elevators hereafter installed there shall be a pit at least three feet deep at the bottom of the shaftways of power elevators. Where new elevators are installed in existing buildings, a less depth of pit than three feet may be permitted by the inspector having jurisdiction if, in his opinion, a depth of three feet is structurally impracticable.

(b) For elevators hereafter installed, car bumpers shall be provided in the pits, located to leave a clear space of not less than 18" between the floor of the pit and the underside of the car platform.

(15) Speed. The speed of power sidewalk elevators hereafter installed shall not exceed 60' per minute.

(16) Lighting.

(a) There shall be electric or gas lighting at each story of a sidewalk elevator, arranged to illuminate the car and its approaches properly. If there is a tight enclosure around the elevator, sufficient light shall be located inside the hatchway.

(b) An electric or gas light shall be provided to properly illuminate the elevator machine which can be lighted without passing over or reaching over any part of the machinery.

12.10: Escalator Installations

(524 CMR 12.10(a)(3a), (7) (a) and (b), (8)(a), (10)(a), (11)(a) and (b), (12)(a) and (b), (13)(a) and (15)(a) do not apply to escalators installed before June 19, 1914.)

(1) Drive. Each escalator shall be driven by an independent electric motor, located at or near the upper landing, except descending escalators installed before December 26, 1923.

(2) Speed. The speed of an escalator shall not exceed 100' per minute, except that escalators installed before December 26, 1923, and operating at a higher speed need not be reduced in speed; but in no case shall the speed of an existing escalator be increased over its present speed.

(3) Electric Brake. Each escalator machine drive shall be provided with an electrically released, mechanically applied brake, which shall stop the escalator automatically when the power is cut off.

12.10: continued

(4) Emergency Stops. There shall be a button or other type switch, located in a conspicuous position at the top and bottom of each escalator. The operation of the button or switch shall cause the opening of the line circuit, stopping the motor and applying the brake. Each button or switch shall be plainly marked "Escalator Stop Button" or "Escalator Stop Switch" as the case may be. It shall be impossible to start an escalator from these switches.

(5) Starting Buttons or Switches. Where starting buttons or switches are accessible to the public, they shall be either of the key operated type, or shall be enclosed in a box provided with a lock and key.

(6) Safety Devices.
(a) Escalators hereafter installed shall be so constructed that if the tread chain or chains should break, the treads will not be displaced from their guides.
(b) Escalators, except those operated by rack type links installed before June 19, 1914, when operating in the ascending direction, shall be equipped with a safety device which shall open the power circuit, apply the machine brake when required, and stop the escalator in case of accidental reversal.
(c) Descending escalators hereafter installed shall be provided with a safety device which shall open the power circuit, apply the machine brake and gradually stop the escalator in case the escalator overspeeds 40%.
(d) Escalators, except those operated by rack type links installed before June 19, 1914, shall be provided with a safety device to open the power circuit, apply the machine brake where required and stop the escalator in case the tread chain or chains break. If a pawl or dog instantaneous type safety is used, it shall be applied to the ascending portion of the treads, and there shall be one dog or pawl near the top of the ascending portion of the escalator platform for carrying passengers, and one near the bottom of this platform; and there shall be dogs or pawls located in intermediate positions such that the maximum distance between pawls measured along the escalator incline shall not exceed ten feet, except that for escalators installed before December 26, 1923, the maximum distance between pawls or dogs may be not over 30'. Pawls or dogs shall be cast or forged steel.
(e) The framework forming the support for the escalator mechanism at its lower end shall be of sufficient strength to safely retain the escalator platform if it should break at any portion of its length.
(f) Escalators operated by polyphase alternating current motor shall be provided with relays of the potential type which will prevent starting the motor if the phase rotation is in the wrong direction or there is a failure of any phase.
(g) Where tension weights are used for tightening devices on escalators, provision shall be made to retain weights in the escalator truss in case the weights should fall.

(7) Links and Chains.
(a) Rack type links, when used to drive the escalator treads, shall be of annealed steel castings of not less than 80,000 lbs. per square inch tensile strength, and shall be provided with friction-bearing surface on the back not less than one inch wide extending the full length of the links. The factor of safety shall not be less than 20".
(b) Where chains are used to operate the treads they shall be constructed of metal of tensile strength of not less than 60,000 lbs. per square inch, and the factor of safety shall be not less than ten.
(c) Replacements of existing links shall be of forged steel with a safety factor of ten or annealed cast steel with a safety factor of 20.

(8) Angle of Inclination. The angle of inclination of an escalator shall not exceed 30° from the horizontal.

12.10: continued

(9) Hand Rails. Escalators shall be equipped on both sides with moving hand rails, operating at the speed of the escalator and in the same direction of travel, except that existing escalators used exclusively for employees need only be equipped with a moving hand rail on one side, provided the escalator is furnished on the side opposite with a smooth enclosure not less than seven feet high. If traction driven type of hand rail is used, an adjustable tension device must be furnished to maintain sufficient traction at all times.

(10) Balustrading. Escalators shall be provided on each side with solid balustrading. On the inside the balustrading shall be smooth without depressed or raised panelling or molding. Glass panels in balustrading hereafter installed are prohibited. There shall be no abrupt changes in width between the balustrading on the two sides of the escalator. Should any change in width be necessary for escalators hereafter installed, the change shall not be more than 8% of the greatest width. In changing from the greater to the smaller width, the change in the direction of the balustrading shall not exceed 15° from the line of the escalator travel.

(11) Width of Escalators.
(a) The width of an escalator shall be measured between the balustrading at a vertical height of 24" above the nose line of the treads.
(b) Escalators hereafter installed shall be not less than 22", nor more than 48" wide.

(12) Escalator Treads and Landings.
(a) Escalator treads hereafter installed shall be of material affording secure foothold, such as hard wood or other material of equal or greater strength.
(b) Escalator landings at the top and bottom of escalators hereafter installed shall be of material affording secure foothold and shall, where practicable, extend not less than three feet from the moving end or sides of the treads.

(13) Strength of Trusses or Girders. For escalators hereafter installed, the trusses or girders shall be designed with a factor of safety of not less than five based on static loads.

(14) Machine Room Lights. There shall be a suitable light in every escalator machine room, as a permanent fixture which can be lighted without passing or reaching over any part of machinery.

(15) Access. For escalators hereafter installed there shall be reasonable access provided for inspection and maintenance.

(16) Tests. A practical test in accordance with the requirements of M.G.L. c. 143,§ 63 shall consist of the following:--
(a) Speed Test. The application of the overspeed safety device where called for shall be obtained by tripping the governor by hand at the rated speed.
(b) Reversal Test. The application of the reversal safety device shall be obtained by operating the escalator by hand in the reverse direction.
(c) Miscellaneous Safety Devices. Test of the machine brake and emergency stop buttons or switches shall be made to determine whether they function properly.

12.11: General (Division E)

(1) Maintenance of Equipment. It shall be the duty of the owner to maintain in proper working order all parts of the elevator installation.

(2) Cleaning and Inspecting Tanks. Pressure and discharge tanks of hydraulic elevators shall be thoroughly cleaned and inspected at least once every three years. It is recommended that pressure tanks be painted inside at least every three years.

12.11: continued

(3) Testing Relief Valves. Relief valves on hydraulic elevator pumps shall be tested not less than once each year.

(4) Shaftway Pits. Elevator shaftways and pits shall be kept clean. No rubbish shall be allowed to accumulate therein, nor shall any part thereof be used for storage.

(5) Machine Rooms and Car Tops. No material not a necessary part of the elevator equipment shall be permitted in any shaftway or machine room, nor on the top or cover of an elevator car or shaftway. Entrance to shaftways and machine rooms shall be kept clear and accessible at all times.

(6) No hatch cover shall be used as a thoroughfare or passage unless the elevator is of the sidewalk type.

(7) Signs in Freight Elevators. Freight elevators shall have eligible sign posted on each car and at each landing, prohibiting unauthorized persons from riding on or operating the elevator car.

(8) Piston rods in tension of hydraulic elevators one inch in diameter or smaller, shall be exposed for inspection at least once in every five years. Piston rods larger than one inch in diameter shall be exposed for inspection at least once in every ten years.

12.12: Practical Tests

(1) A practical test in accordance with the requirements of M.G.L. c. 143,§ 63 shall consist of the following:--

(a) Capacity and speed test.

(b) Car safety tested with full rated load in car.

(c) The application of the safety by a speed governor shall be obtained by causing the car to descend at the governor tripping speed corresponding to the rated speed of the car as specified in Regulation 5m, Section 2, Division B, Page 18.

(d) With alternating current machines when the car and rated load are not sufficient to overhaul the machine at the governor tripping speed, the governor may be tripped by hand at the rated car speed.

(e) The governor shall be sealed wherever practicable so that its adjustments cannot be changed after it has been set to trip at the proper speed.

(f) The application of a safety having no speed governor shall be obtained by a free drop test which may be made without detaching the cables.

(g) A test of the machine brake, machine automatic terminal stop mechanism, hatch limit switches, slack cable or safety switch, emergency car switch or stop buttons, automatic stop valves, car gate and hoistway door interlocks, if any, shall be made to determine whether they function properly.

(h) Car or counterweight oil buffers, if any, shall be tested with full rated load on the platform at a car speed corresponding to governor tripping speed, as specified in Regulation 2e, Section 6, Division B, Page 29.

(2) A practical test as required by M.G.L. c. 143,§ 64, shall consist of the following:--

(a) Car safety tested with full load in car at rated car speed.

(b) The application of the safety by a speed governor shall be obtained by tripping the governor by hand at rated car speed.

(c) The tripping speed of the governor shall be tested, and where possible this may be done without actually applying the car safety.

(d) The governor shall be sealed wherever practicable after this test has been made.

(e) The application of a safety having no speed governor shall be obtained by a free drop test which may be made without detaching the cables.

12.13: continued

(f) A test of the machine brake, machine automatic terminal stop mechanism, hatch limit switches, slack cable or safety switch, emergency car switch or stop buttons, automatic stop valves, car gate and hoistway door interlocks, if any, shall be made to determine whether they function properly.
(g) Car and counterweight oil buffers, if any, shall be tested with no load on the platform at rated car speed.

12.13: Operation of Elevators

((1) Reserved)

(2) Granting of Licenses.
(a) Whoever desires to act as an operator of elevators herein required to be operated by a licensed person shall make application to the department having jurisdiction of elevators in the city or town, on blanks to be furnished by the said department. An application shall be properly filled in and shall be accompanied by a written recommendation from the owner, occupant or lessee of the building in which the elevator or elevators to be operated are located, or by two citizens acceptable to the department. A license shall not be granted to a person less than 18 years of age.
(b) The applicant shall be given a practical examination as to his knowledge of the operation of elevators particularly as to the safeguarding of passengers, by an inspector or by the executive head of the department. Such executive head may, however, delegate the power to grant licenses to any inspector of the department having jurisdiction.
(c) Licenses shall be for the term of one year from the date thereof, but may be renewed yearly by the department having jurisdiction. Licenses in force when these regulations become effective shall remain valid until the term for which they were issued has expired.
(d) It shall be optional with any department granting licenses whether or not a license granted by another department shall be accepted without an examination of the licensee. Such acceptance shall be indicated by the indorsement, across the face of the license, of the inspector having jurisdiction. If the inspector having jurisdiction will not accept by indorsement a license from another department, he may grant a new license with or without examination.
(e) Should an operator lose his license, he shall be granted a duplicate thereof upon application to the department granting the original license. Such application shall state fully all particulars relative to the granting and loss of the license, and the applicant shall make oath to the statements contained in his application.
(f) The fee for a new license shall be $5.00; the fee for a duplicate license shall be .50; and the fee for the renewal of a license shall be $2.00.
(g) Fees shall be payable upon the granting of the respective licenses, and shall accrue to the appropriation of the department granting the licenses, except as otherwise provided by law or ordinance.
(h) The applications and a record of the licenses issued by each department shall be kept by such department.

(3) Revocation and Suspension of Licenses.
(a) A wilful falsification in the matter of a statement in an application shall be deemed sufficient cause for the revocation at any time of a license granted on said application.
(b) A license may be suspended or revoked by an inspector having jurisdiction, if the holder is incompetent or untrustworthy or fails to comply with 524 CMR 12.00.

(4) Display of Licenses. A licensed operator shall at all times when operating an elevator have in his possession his license card, and shall display the same on demand of the owner or occupant of the building, or of any person authorized to inspect the elevator, or of any police officer.

12.13: continued

(5) Designated Operators.

(a) If it appears to an inspector having jurisdiction that an elevator not required by 524 CMR 12.00 to be operated by a licensed operator is being operated without due regard to safety, he may require the owner, occupant, occupants, or lessee to designate one or more reliable persons to operate the said elevator, subject to the approval, in writing, of the head of the department having jurisdiction.

(b) The names of such person or persons so designated shall be made a matter of record by the inspector having jurisdiction, and shall be posted in proper form on the elevator or elevators in question. After being so posted the said elevator or elevators shall not be operated by a person who has not been designated as provided herein, until such time as the requirement for such designated operator has been removed by the department or inspector which made it.

(c) No person, except by authority of the inspector having jurisdiction, shall alter, deface or remove, or cause to be altered, defaced or removed, a designating card.

(d) Permanent elevators used temporarily, before the completion of a building, for carrying workmen and materials shall be operated by "designated operators."

(e) A licensed operator shall be permitted to operate any elevator requiring a "designated operator."

(6) Closing of Doors and Gates.

(a) Operators shall close and lock the landing doors, if there is no automatic landing gate, before starting the elevator.

(b) Operators shall keep passengers far enough from the car opening to protect then and shall keep the car door or car gate closed, if there is one, while the car is in motion.

(7) Locking of Shipper Ropes. Shipper ropes shall be locked by the operator when the cars are being loaded or unloaded.

12.14: Instructions to Operators

(1) Always open the service switch of an electric elevator, or lock the control mechanism of a hydraulic, steam or belted elevator, before cleaning or oiling any part of the machine or regulator and when placing the elevator out of service.

(2) Be sure the control mechanism is locked in the "stop" position before closing the service switch.

(3) Make a trial trip each morning before carrying passengers.

(4) Report any defects promptly.

(5) Do not attempt to make repairs.

(6) Carry no passengers or freight while inspections, repairs or adjustments are being made; and operate the car only in response to directions from the inspector or person in charge. Do not move the car when any one is in the pit or on top of the car, except as they may direct.

(7) See that the "locking device" and "safe-hoisting" attachments, if any, are in place before a safe or other heavy concentrated load is moved on or off the car platform. Do not attempt to raise the car more than a few inches until the "locking device" has been withdrawn.

(8) Do not allow others to ride while a safe or other heavy object near the rated capacity of the elevator is being carried.

(9) Landing doors for passenger elevators and for freight elevators having no landing gates should always be closed and locked before the car is started.

12.14: continued

(10) The car should be brought to a stop at the landing level before the landing door is opened.

(11) Keep car gates, if any, closed while running, and where no car gates are provided keep passengers away from the open edge of the car platform.

(12) Limit the number of passengers to the rated capacity of the car, and do not permit crowding.

(13) Do not reverse the control while passing a landing on receipt of a stop signal. For passenger service, continue the trip and respond to the signal on the next trip.

(14) Move control mechanism to the stop position on approaching the terminal landings. Do not depend on the terminal stops in the ordinary operation of the car.

(15) If the power goes "off" while the car is in motion, move the control mechanism to the "stop" position and start the car in the usual manner upon return of the power.

(16) If the car refuses to stop, do not attempt to jump off. The car will be stopped by the operation of the safeties if it attains excessive speed of descent, or by the automatic terminal stops at either end of the hoistway.

(17) If the car should stop suddenly, call for the engineer in charge.

(18) Before allowing freight or passengers to be loaded or unloaded, lock the control mechanism in the "stop" position.

(19) Familiarize yourself with the emergency devices, understand their function and know how to operate them.

(20) Never leave the car in the ordinary course of operation, nor leave the control mechanism unprotected. When going off duty for any reason, even for a few minutes, be sure that the power is disconnected or that the control mechanism is locked and the hoistway doors closed. When service is suspended for any reason during the ordinary operating hours, display a "NOT RUNNING" sign at each landing.

(21) Before starting the elevator, make sure that the load is securely in place and that no portion overhangs the car platform.

(22) Remember the safe capacity of the elevator, and never allow it to be overloaded. If the load is heavy, see that it is well distributed over the car.

(23) If the hand-rope is too tight or too loose, it should be reported and adjusted by a licensed elevator mechanic, as the tension of the rope changes with the condition of the atmosphere.

(24) In running a belt-driven elevator, be sure to pull the hand-rope as far as possible when starting the car. In so doing you throw the belt full on the tight pulley, and thus prevent it from slipping. In stopping, use the centering rope.

(25) If the safety device should operate and stop the car, shut off the power and send for the foreman or engineer. While waiting, do not attempt to release the safety device; keep cool, and do not allow anyone to try to get off the elevator.

(26) Never allow anyone to scuffle or fool on the elevator. It is always dangerous.

12.14: continued

(27) Never, under any conditions, allow anyone to get on or off the car while it is moving.

(28) Never reverse the direction of the car suddenly. Always bring it first to a full stop and start slowly.

(29) Keep your mind on your work. Always remain at your post while the car is moving so that you can stop it quickly in an emergency.

(30) Learn these instructions thoroughly, and keep a copy in your pocket or in the car.

12.15: Builders' Elevators and Temporary Use of Permanent Elevators

(1) Builders' Elevators. (Note.--Regulations other than 524 CMR 12.15(1) and (2) do not apply to builders' elevators.)

(2) Inspection.

(a) No builder's elevator shall be put in use until notice has been given to the department or inspector having jurisdiction, after which its use shall be subject to the approval of such department or inspector.

(b) Slack Cable Safety and Protection of Openings.

1. Builders' elevators used during the construction of buildings or other structures shall be equipped with safety devices which shall bring the cars to rest if the hoisting cables become slack or break.

2. Each landing opening of all such elevators shall be protected by movable bar or bars about three feet four inches high, or the equivalent.

3. Each floor opening of all such elevators shall be protected by a fixed enclosure, fence or guard on the unused sides at least five feet high.

(2) Temporary Use of Permanent Elevators. (Note.--See 524 CMR 12.13(5)(d) regarding operation.)

(a) Use Subject to Approval of Inspector. An elevator installed for permanent use may be used temporarily before completion during the construction of the building for carrying workmen and materials, subject to the approval of the inspector having jurisdiction.

(b) Car Enclosures. Temporary cars on permanent installations, and permanent cars when put into temporary use, shall be enclosed on all sides, except the landing sides, at least five feet high and shall be provided with suitable covers to protect persons on the car from falling materials.

(c) Slack Cable Safety. Permanent elevators so temporarily used shall be equipped with safety devices which shall bring the cars to rest if the hoisting cables should become slack or break.

(d) Protection of Openings.

1. Each landing opening of such elevators shall be protected by a hinged bar or by a gate about three feet four inches in height, unless the permanent gates or landing doors are installed.

2. The unused sides of the shaftway shall be protected by suitable enclosures not less than five feet high.

(e) Operator. No such elevator car shall be used temporarily unless in charge of a licensed or designated operator.

REGULATORY AUTHORITY

524 CMR 12.00: M.G.L. c. 143, § 68.

NON-TEXT PAGE

524 CMR 13.00 and 14.00: RESERVED)

(PAGES 109 AND 110 ARE RESERVED FOR FUTURE USE.)

524 CMR 15.00: ELEVATOR, DUMB-WAITER, ESCALATOR AND MOVING WALK REGULATIONS: GENERAL

Section

15.01: Elevator, Dumb-waiter, Escalator and Moving Walk Regulations: General
15.02: Age Requirement

15.01: Elevator, Dumb-waiter, Escalator and Moving Walk Regulations: General

Pursuant to the provisions of M.G.L. c. 143, § 69, as amended, the Board of Elevator Regulations herewith amends existing regulations 524 CMR 15.00 through 35.00 for the construction of elevators, dumb-waiters, moving stairways (escalators), and moving walks.

The following amended regulations 524 CMR 15.00 through 35.00 shall be applicable to a new installation, a re-location, or a material change for which plans and specifications are submitted for approval on or after the effective date hereof.*

All plans for elevator installation, re-location, or material change shall be signed by a registered architect or registered professional engineer and shall bear his registering stamp certifying that he has examined the plans and finds that the building structure will comply with the contract load plus its tare.

The following shall be considered material changes:

(a) If the speed of an existing elevator is increased;
(b) If the capacity of an existing elevator is increased;
(c) If the travel of an existing elevator is extended;
(d) If the machine room of an existing elevator is re-located; or,
(e) If the classification of an elevator is changed from freight to passenger.

Any change from DC (direct current) to AC (alternating current) or any change in voltage shall not be considered a material change, provided the speed or capacity of the installation is not increased.

Any complete part of an existing installation which is replaced, such as a machine, car, hoistway enclosure, gates, doors, doorlocking devices, controller, operating devices, load weighing devices, etc., shall be installed in accordance with the regulations for new installations; but such existing parts as remain in service (and which are properly maintained in accordance with regulations in effect at the time of installation, re-location, or material change) need not be changed to conform with the regulations for new installations.

EXCEPTION: Existing parts of elevators, dumbwaiters, and escalators (moving stairways) installed in accordance with regulations in effect prior to March 9, 1950 shall be maintained in conformity with applicable provisions of regulations 524 CMR 3.00 through 11.00.

15.02: Age Requirement

No person under the age of 18 shall be allowed to work on or operate any elevator equipment covered under 524 CMR.

REGULATORY AUTHORITY

524 CMR 15.00: M.G.L. c. 143, § 69.

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* NOTE: M.G.L. c. 30A, §§ 5 and 6 as amended, provide that regulations shall become effective upon the date of publication by the Secretary of the Commonwealth.

NON-TEXT PAGE

524 CMR 16.00: ELEVATORS, DUMB-WAITERS, ESCALATORS AND MOVING WALKS: DEFINITIONS

Section

16.00: Elevators, Dumb-waiters, Escalators and Moving Walks: Definitions

16.00: Elevators, Dumb-waiters, Escalators and Moving Walks: Definitions

In 524 CMR 16.00 the following terms shall have the meanings respectively assigned to them. They are not intended, however, as a complete glossary of terms used in connection with elevator installations.

Annunciator. Elevator Car: An elevator car annunciator is an electrical device in the car, which indicates the landings at which hall buttons have been pressed.

Bank. A group of elevators sharing the same hoistway or machine room and grouped in series and/or operated by the same dispatching system.

Buffer. A buffer is a device to absorb the impact of the car or counterweight at the extreme limits of travel.

Capacity. The capacity of an elevator is the load which the elevator is designed and equipped to adequately handle as determined by 524 CMR 16.00 or by the inspector having jurisdiction.

Car Door or Gate. A car door or gate is the door or gate attached to the elevator car which closes the opening regularly used for entrance and exit.

Car Door or Gate Electric Contact. A car door or gate electric contact is a device which opens the operating circuit, or an auxiliary circuit, when the car door or gate is open beyond the closed position and thus prevents operation of the elevator car by the operating devices.

Car, Elevator. An elevator car is the load-carrying unit, including its platform, car frame, and enclosure.

Car Enclosure. The car enclosure or cab of an elevator is the enclosure consisting of walls and the top or cover built upon the platform.

Car Frame or Car Sling. A car frame or car sling is the supporting frame to which the car platform upper and lower sets of guide shoes and the hoisting ropes are attached.

Car Platform. The car platform is the structure which forms the floor of the car and which directly supports the load.

Clearance, Bottom Car. Bottom clearance of the elevator car is the clear vertical distance between the underside of the car platform or between the underside of any equipment attached thereto, exclusive of the car frame channels, car safety blocks, guide shoes and any aprons or guards attached to the car sill, and the pit floor when the car rests on the fully compressed buffer.

Clearance, Bottom Counterweight. The bottom clearance of the counter-weight is the vertical distance between the counterweight buffer and its striker plate when the car is level with the top terminal landing.

Clearance, Top Car. Top clearance of the elevator car is the distance the car floor can travel above the level of the upper terminal landing without any part of the car or devices attached thereto coming in contact with the overhead structure.

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Clearance, Top Counterweight. Top clearance of the elevator counterweight is the shortest vertical distance between any part of the counterweight structure and the nearest part of the overhead structure or any other obstruction when the car floor is level with the lower terminal landing.

Contract Load. Contract load is the rated capacity in pounds specified in the contract for the purchase of the elevator and in the application for the permit.

Contract Speed. Contract speed is the speed in feet per minute, specified in the purchase contract or in the application for permit, to be attained by the elevator in the up direction with contract load in the car.

Control. The control of an elevator is a system of regulation by which the starting, stopping, direction of motion, acceleration, speed, and retardation of an elevator are governed.

Control, Generator-Field. Generator-field control is a system in which control is primarily accomplished by the use of an individual generator for each elevator, in which the voltage applied to the hoisting motor is adjusted by varying the strength and direction of the generator-field.

Control, Multi-Voltage. Multi-voltage control is a system in which control is accomplished primarily by impressing successively on the armature of the hoisting motor a number of substantially fixed voltages such as may be obtained from multi-commutator generators common to a group of elevators.

Control, Rheostatic. Rheostatic control is a system in which control is accomplished primarily by varying resistance or reactance in the armature on field circuit of the hoisting motor.

Control, Two-Speed Alternating Current. Two-speed, alternating current elevator control is a control for a two-speed induction elevator motor which is arranged to run at two different, practically constant speeds, by connecting the motor windings so as to obtain different numbers of poles.

Control, Variable Voltage. (Same as generator-field control.)

Controller, Electric Elevator. An electric elevator controller is a device, or a group of devices, which serves to govern, in some predetermined manner, the electric power delivered to the apparatus to which it is connected.

Discharge Tank. A discharge tank used to emit fluid at an adequate flow exclusive of external pressure.

Dispatching Device, Automatic. An automatic dispatching device is a device whose principal function is to automatically operate a signal in the car to indicate when the car should leave the terminal.

Door Closer. A door closer is a device, operated by gravity or other means, which will automatically close a door when released by the operator or by suitable automatic means.

Door or Gate Device, Power-Operated. A power-operated door or gate device is a device or assemblage of devices, the purpose of which is to open or close the hoistway door or car door or gate by power other than by hand, gravity, springs, or the movement of the car.

Door Operator, Elevator Electric. An elevator electric door operator is an electric device for operating the hoistway or car doors, or both.

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Dumb-waiter. A dumb-waiter is a hoisting and lowering mechanism equipped with a car which moves in guides in a substantially vertical direction the floor area of which does not exceed nine square feet, whose total internal car height whether or not provided with fixed or removable shelves does not exceed four feet; the capacity of which does not exceed 500 lbs. and which is used exclusively to transport material in a substantially vertical direction.

Dumb-waiter, Electric. An electric dumb-waiter is one in which the motion of the car is obtained through an electric motor directly applied to the dumb-waiter machinery.

Elevator. An elevator is a hoisting and lowering mechanism for the transportation of persons or materials, which is equipped with a car or solid level platform moving in guides at an angle of 30° or less from the vertical, which serves two or more fixed landings (including balconies and mezzanines) on the inside or outside of a building or structure, and which shall be enclosed and equipped as required.

Elevator, Automatic Push Button Electric. An electric automatic push button elevator is one that is started in response to the momentary actuation of operating devices at the landing, and/or of operating devices in the car identified with the landings, and/or in response to an automatic starting mechanism and wherein the car is stopped automatically at the landing.

Elevator, Auxiliary Power. An auxiliary power elevator is one having a source of mechanical power in common with other machinery.

Elevator, Builder's Hoist. A builder's hoist elevator is an elevator erected for temporary use, built in or adjoining a building under construction or alteration.

Elevator, Continuous Pressure. A continuous-pressure electric elevator is one operated by means of push buttons or switches at the landings with or without push buttons in the car which requires a button or switch to be held manually in contact to keep the car in motion.

Elevator, Double-Belted. A double-belted elevator is an auxiliary power elevator in which the direction of motion is changed without reversal of the prime mover.

Elevator, Electric. An electric elevator is one in which the motion of the car is obtained through an electric motor directly applied to the elevator machinery.

Elevator, Alternating Current. An alternating current elevator is an electric elevator equipped with an alternating current motor directly applied to the elevator machinery.

Elevator, Electro-Hydraulic. An electro-hydraulic elevator is one in which the lifting of the car is obtained by means of an electric motor driving a pump which pumps liquid directly into the cylinder.

Elevator, Freight. A freight elevator is an elevator used primarily for carrying freight and on which only the operator and persons loading or unloading the freight are permitted to ride.

Elevator, Gravity. A gravity elevator is an elevator in which gravity is the source of power.

Elevator, Hand. A hand elevator is an elevator driven by manual power.

Elevator, Hydraulic. A hydraulic elevator is an elevator in which the motion of the car is obtained from liquid under pressure.

Elevator, Passenger. A passenger elevator is an elevator that is used to carry persons other than the operator and persons necessary for loading and unloading.

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Elevator, Platform. A platform elevator is an elevator the platform of which is directly supported at three or more points by suspension members which are relied upon to maintain the platform substantially level.

Elevator, Plunger. A plunger elevator is a hydraulic elevator having a ram or plunger directly attached to the underside of the car platform.

Elevator, Power. A power elevator is an elevator in which the motion of the car is obtained through the application of energy other than by hand or gravity.

Elevator, Private Residence. A private residence elevator is a power passenger elevator installed in a private residence, serving only a single family, and which has a rated load not in excess of 700 lbs., the contract speed not in excess of 50 feet per minute, a net inside platform area not in excess of 12 square feet, and a rise not in excess of 50 feet.

Elevator, Rope Geared Hydraulic. A rope geared hydraulic elevator is one in which the motion of the car is obtained by multiplying the travel of a piston or ram by a system of sheaves over which the hoisting ropes operate.

Elevator, Self-Service. A self-service elevator is one that is started by means of momentary pressure of push buttons at the landings, with or without push buttons in the car, and whose landing stops are automatic. An elevator shall not be deemed to be self-service if an operator has been permanently or regularly assigned to its operation.

Elevator, Sidewalk. A sidewalk elevator is an elevator the upper hatch opening of which is located either partially or wholly outside the building and which has no opening into the building at its upper terminal landing. (See 524 CMR 20.00.)

Elevator, Signal Operation. See "Signal Operation".

Elevator, Steam. A steam elevator is an elevator in which the motion of the car is obtained from a steam engine directly applied to the elevator machinery.

Emergency Release. An emergency release is a device the purpose of which is to make inoperative door or gate electric contacts or door interlocks in case of emergency.

Emergency Stop Switch. An emergency stop switch is a device in the car used to cut off the power from the elevator machine and brake independently of the position of the operating devices.

Escalator. A moving stairway.

Escalator, Electric. An electric escalator is one in which the motion is obtained through an electric motor directly applied to the escalator machinery.

Existing Installation. An existing installation is an elevator or moving stairway, for which a permit was issued for its erection, to increase its speed, to increase its capacity, to extend its travel, or to relocate its machine room, before the effective date of 524 CMR 16.00.

Fire-Resistive Construction. A method of construction which prevents or retards the passage of hot gases or flames, as defined by the fire-resistance rating.

Fire-Resistive Rating. The measured time in hours or fractions thereof that the material or construction will withstand fire exposure as determined by the fire tests conducted in conformity to recognized standards.

Hoistway. A hoistway is any opening or series of vertical openings in one or more floors of a building through which one elevator or dumb-waiter operates.

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Hoistway Door or Gate. A hoistway door or gate is the hinged or sliding portion of the hoistway enclosure which closes the opening giving access to the elevator or dumbwaiter car at any landing.

Hoistway Door or Gate, Bi-Parting. A bi-parting door or gate is a vertical slide, horizontal slide, or swing door or gate consisting of two or more sections so arranged that the sections, or pairs of sections, open away from each other and so interconnected that both sections operate simultaneously.

Hoistway Door or Gate Electric Contact. A hoistway door or gate electric contact is a device the purpose of which is to open the operating circuit, or an auxiliary circuit, unless the hoistway door or gate at which the car is standing is in the closed position, and thus prevent operation of the elevator by the operating devices in a direction to move the car away from the landing.

Door Unit System is a contact system which meets the requirements of the contact definition above, but does not require all the hoistway doors to be closed.

Hoistway Unit System is a contact system which meets the requirements of the contact definition above, and also requires that all hoistway doors are closed.

Hoistway Door or Gate, Full Automatic. A full automatic door is a vertically-moving door or gate which is opened directly by the motion of the elevator car approaching any landing and closed by gravity as the car leaves any landing.

Hoistway Door or Gate, Manually Operated. A manually operated door or gate is a door or gate which is opened and closed by hand.

Hoistway Door or Gate, Power Operated. A power operated door or gate is a door or gate which is opened or closed by power other than by hand, gravity, springs, or the movement of the car, and are further defined as follows:

Power-Closed Door or Gate. A power-closed door or gate is a door or gate which is manually opened and is closed by power other than by hand, gravity, springs, or the movement of the car.

Power-Opened, Self-Closing Door or Gate. A power-opened, self-closing door or gate is a door or gate which is opened by power other than by hand, gravity, springs, or the movement of the car, and is closed by energy stored during the opening operation.

Power-Operated Door or Gate, Automatically Opened. A power-operated door or gate, automatically opened, is a door or gate which is opened by power other than by hand, gravity, springs, or the movement of the car, the opening of the door being initiated by the arrival of the car at or near the landing. The closing of such door or gate may be under the control of the elevator operator or may be automatic.

Power-Operated Door or Gate, Manually Controlled. A power-operated door or gate, manually controlled, is a door or gate which is opened and closed by power other than by hand, gravity, springs, or the movement of the car, the door movement in each direction being controlled by the elevator operator.

Self-Closing Door or Gate. A self-closing door or gate is a door or gate which is opened manually and closed when released.

Semi-Automatic Door or Gate. A semi-automatic door or gate is a door or gate which is opened manually and which closes automatically as the car leaves the landing.

Hoistway Door Interlock. A hoistway door interlock is a device, the purpose of which is:

First: To prevent the operation of the elevator machine by the operating devices in a direction to move the car away from a landing unless the hoistway door at that landing at which the car is stopping or is at rest is locked in the closed position.

Second: To prevent the opening of the hoistway door from the landing side; unless the car is at rest within the landing zone, or is coasting through the landing zone with its operating device in the stop position.

16.00: continued

Door Unit System is an interlocking system which meets the requirements of the interlock definition above, but does not require all the hoistway doors to be locked in position.

Hoistway Unit System is an interlock system which, in addition to fulfilling the requirements given under the definition of interlock, will also prevent the operation of the car by the operating devices unless all hoistway doors are locked in the closed position.
Hoistway, Multiple. A hoistway for more than one elevator or dumb-waiter.
Hoistway, Single. A hoistway for a single elevator or dumb-waiter.

Hoistway, Elevator or Dumbwaiter. A shaftway for the travel of one or more elevators or dumb-waiters. It includes the pit and terminates at the underside of the overhead machinery space floor or grating, or at the underside of the roof where the hoistway does not penetrate the roof.

Hoistway Enclosures. The fixed structure consisting of vertical walls or partitions which isolates the hoistway from all other parts of the building or from an adjacent hoistway and in which the hoistway doors and door assemblies are installed.

Inching Device. An inching device is a set of "up" and "down" continuous-pressure buttons located on the car arranged to permit the manual operation of the car when within the inching zone toward the landing level where the landing doors, or gates, or the car doors or gates, are not in the locked or closed position.

Inching Zone. A car is considered within the meaning of 524 CMR 16.00 as being within the inching zone when the car is eight inches below any landing, or eight inches above any landing.
NOTE: Where controlled by the operator by means of up-down continuous pressure switches in the car, this device is known as an "inching" device. Where used with a hydraulic elevator to correct automatically a change in the car level by linkage in the hydraulic system, this device is known as an "anti-creep device".

Landing, Elevator. An elevator landing is that portion of a floor, balcony, or platform used to receive and discharge passengers or freight.

Landing Zone. A car is considered, within the meaning of 524 CMR 16.00, as being within the landing zone when the car floor is not more than 18" above or below the landing.

Leveling Device. A car-leveling device is any mechanism or control which will automatically move the car within a limited zone toward, and stop the car at the landing.

Machine, Elevator. An elevator machine is the machinery and its equipment used in raising and lowering the elevator car or platform, and are further defined as follows:

Machine, Chain Driven. A chain driven elevator machine is an elevator machine connected to a reversible motor, engine, or turbine by a chain.

Machine, Direct-Drive. A direct-drive machine is one in which the driving motor is connected directly to the driving sheave or drum with or without intermediate mechanism or gears.

Machine, Single-Belted. A single-belted elevator machine is an elevator machine connected to a reversible motor, engine, or turbine by a belt.

Machine, Double-Belted. A double-belted elevator machine is an elevator machine connected to a non-reversible prime mover by two belts through which the direction of motion is changed.

Machine, Spur-Geared. A spur-geared machine is one in which power is transmitted to the driving sheaves or drum through spur gearing.

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Machine, Traction. A traction is an elevator machine in which the motion of the car is obtained through friction between the hoisting ropes and the taction sheave.

Geared-Traction. A geared-traction machine is a traction machine which employs gearing between the electric motor and the traction sheave.

Gearless-Traction. A gearless-traction machine is a traction machine which has the traction sheave and the brake drum mounted directly on the electric motor shaft.

Machine, Winding Drum. A winding-drum machine is an elevator machine in which the ropes are fastened to and wind on a drum.

Machine, Worm-Geared. A worm-geared machine is one in which the power is transmitted to the driving sheaves or drum through worm gearing.

Material Change. The following shall be considered material changes: (a), if the speed of an existing elevator is increased; (b), if the capacity of an existing elevator is increased; (c), if the travel of an existing elevator is extended; (d), if the machine room of an existing elevator is re-located; and (e), if the classification of an elevator is changed from freight to passenger.

Moving Stairway. A moving stairway is a moving inclined continuous stairway or runway used for raising or lowering persons.

New Installation. A new installation is any installation for which application for approval of plans or a permit for construction is filed on or after the effective date of these regulations; any installation which is re-located; any installation which is materially changed.

Non-Stop Switch, Elevator. A Non-stop switch is a switch which when thrown will prevent the elevator from making hall stops and will automatically transfer these hall stop signals to the next car following, or, where no other car is provided, hold the floor stop calls registered until the elevator answers them.

Oil Buffer Stroke. The stroke of an oil buffer is the oil displacing movement of the buffer plunger or piston and does not include the travel of the buffer plunger accelerating device.

Operating Devices. The operating device is the car switch push button, or other device employed to enable the operator to actuate the controller.

Operation. Operation is the method of actuating the controller by the operating devices.

Operation, Automatic. Operation wherein the starting of the elevator is effected in response to the momentary actuation of the operating devices at the landing, and/or of operating devices in the car identified with the landings, and/or in response to an automatic starting mechanism, and wherein the car is stopped automatically at the landings.

Non-Selective Collective Automatic Operation. Non-selective collective automatic operation is automatic operation by means of one button in the car for each landing level served and one button at each landing, wherein all stops registered by the momentary pressure of landing or car buttons are made irrespective of the number of buttons pressed or of the sequence in which the buttons are pressed. With this type of operation, the car stops at all landings for which buttons have been pressed, making the stops in the order in which the landings are reached after the buttons have been pressed but irrespective of its direction of travel.

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Selective Collective Automatic Operation. Selective collective automatic operation is automatic operation by means of one button in the car for each landing level served and by "up" and "down" buttons at the landings, wherein all stops registered by the momentary pressure of the car buttons are made as defined under non-selective collective automatic operation, but wherein the stops registered by the momentary pressure of the landing buttons are made in the order in which the landings are reached in each direction of travel after the buttons have been pressed. With this type of operation, all "up" landing calls are answered when the car is traveling in the "up" direction and all "down" landing calls are answered when the car is traveling in the "down" direction, except in the case of the uppermost or lowermost calls, which are answered as soon as they are reached, irrespective of the direction of travel of the car.

Single Automatic Operation. Single automatic operation is automatic operation by means of one button in the car for each landing level served and one button on each landing, so arranged that if any car or landing button has been pressed the pressure of any other car or landing operating button will have no effect on the operation of the car until the response to the first button has been completed.

Car-Switch Operation. Car-switch operation is operation wherein the starting, direction of motion, and the stopping of the car are directly and solely under the control of the operator by means of a self-centering switch or by constant pressure buttons in the car.

Car-Switch Automatic Floor-Stop Operation. Car-switch automatic floor-stop operation is operation in which the stop is initiated by the operator from within the car with a definite reference to the landing at which it is desired to stop, after which the slowing down and stopping of the elevator is automatically effected.

Continuous Pressure Operation. Continuous pressure operation is operation by means of push buttons or switches at the landings with or without buttons in the car; any one of which may be used to control a movement of the car so long as the button or switch is manually held in the operating position.

Dual Operation. Dual operation is a system of operation whereby the controller of an automatic operation elevator is arranged so that, on the throwing of a transfer switch the starting of the car is solely under the control of an operator in the car. Landing stops may be either automatic or under the control of the operator.

Pre-Register Operation. Pre-register operation is operation in which signals to stop are registered in advance by buttons in the car and at the landings. At the proper point in the car travel the operator in the car is notified by a signal, visual, audible, or otherwise, to initiate the stop, after which the landing stop is automatic.

Signal Operation. Signal operation is operation by means of single buttons or switches, or both, in the car, and up or down direction buttons, or both, at the landings, by which pre-determined landing stops may be set up or registered for an elevator or for a group of elevators. The stops set up by the momentary pressure of the car buttons are made automatically in succession as the car reaches those landings, irrespective of its direction of travel or the sequence in which the buttons are pressed. The stops set up by the momentary pressure of the up and down buttons at the landing are made automatically by the first available car in the group approaching the landing in the corresponding direction, irrespective of the sequence in which the buttons are pressed. With this type of operation, the car can be started only by means of a starting switch or button in the car.

Overhead Structure. The overhead structure is all the structure and platforms which support the elevator equipment at the top of the hoistway.

Overtravel, Bottom. Bottom overtravel of the elevator car is the distance the car floor can travel below the level of the lower terminal landings until the weight of the fully loaded car rests on the buffers, and includes the resulting buffer compression. Bottom over travel of the counterweight is the distance the counterweight can travel below its position when the car platform is level with the upper terminal landing until the full weight of the counterweight rests on the buffers, and includes the resulting buffer compression.

Overtravel, Top. Top overtravel of the elevator car is the distance the car floor can travel above the level of the upper terminal landing until the counterweight buffer is fully compressed.

16.00: continued

Panelboard. A single panel or a group of panel units designed for assembly in the form of a single panel; including buses, and with or without switches and/or automatic overcurrent protective devices for the control of light, heat or power circuits of small individual as well as aggregate capacity; designed to be placed in a cabinet or cutout box placed in or against a wall or partition and accessible only from the front. (See "Switchboard").

Physically Handicapped Person:

(a) a person confined to a *wheelchair*

(b) a person who, because of the use of *braces or crutches*, or because of the loss of a foot or leg, or because of an arthritic, spastic, pulmonary or cardiac condition, walks with difficulty or insecurity

(c) a person who, due to a brain, spinal or peripheral nerve injury, suffers from *faulty* coordination or palsy

(d) a person who is *blind* or whose sight is so impaired that functioning in a public area he is insecure or exposed

(e) a person whose *hearing* is so impaired that he is unable to hear warning signals

(f) a person whose mobility, flexibility, coordination and perceptiveness are significantly reduced by *aging*.

Position Indicator. A position indicator is a device which indicates the position of the elevator car in the hoistway. It is called a hall position indicator when placed in the hall or a car position indicator when placed in the car.

Potential Switch, Elevator. An elevator potential switch is a magnetic-type switch which disconnects the power from the elevator apparatus when the supply voltage fails or decreases below a definite value and which is usually opened by various electrical safety devices.

Pressure Tank. A pressure tank where the fluid pressure is obtained by electrical or mechanical force by admitting steam, air or other gas, to the tank.

Rated Load. The load which the elevator, dumbwaiter, escalator or private residence inclined lift is designed and installed to lift is designed and installed to lift at the rated speed.

Rated Speed. The speed at which the elevator, dumb-waiter, escalator or private residence inclined lift is designed to operate under the following conditions:

(a) Elevator or Dumbwaiter - The speed in the up direction with rated load in the car;

(b) Escalators, Private Residence Inclined Power and Passenger Lifts, Stairway Inclined Lifts or Chair Devices - The rate of travel of the steps or carriage, measured along the angle of inclination, with rated load on the steps or carriage. In the case of a reversible escalator, the rated speed shall be the rate of travel of the steps in the up direction, measured along the angle of inclination, with rated load on the steps.

Runby, Top. The top runby of the elevator car is the distance the car floor can travel above the level of the upper terminal landing until the counterweight strikes the counterweight buffer.

Safety, Car or Counterweight. A car or counterweight safety is a mechanical device attached to the car or counterweight frame to stop and hold the car or counterweight in case of pre-determined overspeed, free fall, or through slackening of the ropes.

Safety Governor. A safety governor is a device which together with the governor safety ropes is designed to set the car or counterweight safeties at a pre-determined rate of overspeed.

Safety Plank. A safety plank is the lower structural member of the car frame which supports the car platform and includes the car safety, its actuating mechanism and the lower set of guide shoes.

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Shutdown Device, Elevator Automatic. An elevator automatic shutdown device is one that automatically disconnects the elevator apparatus, usually the motor-generator set, after the elevator has remained stopped for a definite time interval, which time interval may be adjustable.

Signal Button, Elevator Hall. An elevator hall signal button is a push button placed in the elevator hallways, by momentary pressure of which a stop signal is registered in the car.

Signal Device, Elevator Car Flash. An elevator car flash signal device is one providing a signal light in the car, which is illuminated when approaching the landings at which all buttons have been pressed.

Signal System, Elevator Separate. An elevator separate signal system is one providing push buttons in the hallways, which, when momentarily pressed by a person desiring elevator service, indicate in the car where the operator is to stop, by illuminating a flash signal or operating an annunciator.

Signal Transfer Device, Elevator Automatic. An elevator automatic signal transfer device is one used with manually operated elevators, by means of which the signal is automatically transferred to the next car following, in case a car passes a set signal without making a stop.

Signal Transfer Switch. A signal transfer switch is a switch in the car which may be thrown by the operator when the car is filled or when, for some other reason, it is desirable to pass a signal, and which thereby transfers the signal to the next car approaching in the same direction.

Slack-Rope Switch, Elevator. An elevator slack-rope switch is a device for automatically cutting off the power in case the hoisting ropes become slack.

Special Retarding Device or Speed Control. A special retarding device or speed control is a slow-down device so arranged that when the elevator does not slow down to a predetermined speed when approaching a terminal landing, an emergency retarding force is applied.

Starter's Panel, Elevator. An elevator starter's panel is an assembly of devices by means of which the starter is kept informed of the condition of the elevator service. This panel is generally located in the elevator hallway on the main entrance level.

Stroke of Oil Buffer. See "Oil Buffer Stroke."

Switchboard. A large single panel, frame, or assembly of panels, on which are mounted, on the face or back or both, switches, overcurrent and other protective devices, buses and usually instruments. Switchboards are generally accessible from the rear as well as from the front and are not intended to be installed in cabinets. (See "Panelboard")

Terminal Stopping Device, Final. A final terminal stopping device is an automatic device for stopping the car and counterweight from contract speed, within the top clearance and bottom overtravel, independently of the operation of the normal terminal stopping device and the operating device.

Terminal Stopping Device, Normal. A normal terminal stopping device is an automatic device for stopping the elevator car at or near the terminal landings, independently of the operation of the operating device and the final terminal stopping devices.

Travel. The travel, or rise, of an elevator or dumb-waiter is the vertical distance between the bottom terminal landing and the top terminal landing.

Traveling Cable. An electric traveling cable is a cable made up of electric conductors, which provides electrical connection between the car and stationary apparatus.

16.00: continued

Undercounter Dumb-waiter. One which has the top terminal landing located beneath a counter and which serves only this landing and the bottom terminal landing.

Waiting Passenger Indicator. A waiting passenger indicator is an indicator which shows, for a single elevator or a group of elevators, where and for which direction hall buttons have been pressed, and also indicates when these calls have been answered. This indicator is usually located at the main lobby floor where it may be seen by the starter.

Working Pressure. The pressure measured at the cylinder of a hydraulic elevator when lifting the car and its rated load at rated speed.

Welding. Welding of parts upon which safe operation of all equipment contained in the Massachusetts Elevator and Escalator Code Regulations depends shall be done by qualified welders; and all work upon completion shall be approved by the enforcing authority before the elevator, escalator, dumb-waiter, etc. is placed in service. The welders may be qualified by one of the following:

(a) by the manufacturer;
(b) by a professional consulting engineer;
(c) by a recognized testing laboratory.

EXCEPTIONS: Tack welds not later incorporated into finished welds carrying calculated loads.

REGULATORY AUTHORITY

524 CMR 16.00: M.G.L. c. 143, § 69.

NON-TEXT PAGE

524 CMR 17.00: POWER PASSENGER AND FREIGHT ELEVATORS

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17.01: Hoistway Enclosures: General

(1) The hoistways of all elevators shall be enclosed throughout their height.

(2) When the elevator hoistway penetrates any fully enclosed solid floor above the bottom landing, walls of hoistway shall be of two hour firerated construction enclosed with non-combustible materials.

NOTE: Elevator hoistways exposed to wheeled traffic shall be so designed as to withstand the impact loads of such traffic.

(3) Where the elevator serves only open construction floors or open balcony floors within one story, the hoistway wall shall be of non-combustible materials.

(4) All windows in exterior and interior walls of an elevator hoistway are prohibited.

(5) Not more than four elevators shall be installed in the same hoistway.

17.01: continued

(6) Dividing wall partitions which are located within an elevator hoistway shall be constructed with solid walls of not less than ¾ hour fire-resistive construction.

(7) Where the roof of a building has a fire-resistive rating in whole or in part of less than two hours, the hoistway may be covered at or below the roofline with a two-hour fire-rated cap, provided a two-hour vent 3½% of hoistway area) extends directly vertically upward from hoistway through roof and at least three feet beyond the roof surface. In all cases, bottom of vent opening shall be at least three feet above the roof. In sloping roof, the three-foot distance above the roofline shall be measured from the highest point where the vent emerges through the roof.

(8) Where the entire roof of a building has a fire-resistive rating of two hours or more, the hoistway may be capped with a two-hour fire-rated constructed material. Hoistway ventilation shall be a minimum of 3½% of the area of the hoistway, the section may be brought directly through the roof to a height of three feet above the roof and be of two-hour fire-rated construction material.

(9) All plans for elevator installations shall be signed by a registered professional engineer or a registered architect and shall bear his registering stamp certifying that he has examined the plans and finds that the hoistway structure including the supports as shown on the plans will comply with the contract load plus its tare. The complete elevator installation shall comply with the Massachusetts elevator code now in effect.

(10) Data on Elevator Layouts. Applications and elevators layouts must be filed and approved before any work can begin.

(a) Type of hoistway material to be used.
(b) Height of hoistway in regard to roof of building. Fire rating of building roof.
(c) Location of hoistway and machine room vents; size of vents.
(d) Location of the machine room.
(e) Type of hoistway doors; fire rating of doors must be shown on the layout; filling in around hoistway door frames and headers for proper fire rating; grouting of landing sills.
(f) Type of approved interlock.
(g) Buffers, type and rating.
(h) Governor, type and name plate depicting tripping speed, and overspeed switch material of governor rope and size.
(i) Hoist rope: size, number and breaking strength.
(j) Type of safeties and location.
(k) Type of valve unit, pressure relief setting, piston size and travel.
(l) Type of drive machine, speed and capacity.
(m) Type of control. Voltage and amps.
(n) The bracket spacing.
(o) The estimated maximum forces on counterweight guide rails on the application of said safety where provided.
(p) All freight elevators for B or C loading (See 524 CMR 17.15(3) and 17.30(4) through 17.32(6)). The horizonal forces on the car guide rail faces on the application of the counterweight safety, where provided.
(q) Outside diameter and wall thickness of cylinder plunger and piping including the working pressure.

(11) Glass hoistways must conform to the same regulations as listed in 524 CMR 17.14(1)(g).

(12) For elevators which are not fully enclosed, protection shall be provided adjacent to areas permitting the passage of people (passageways, stairways and elevator landings). This protection shall be fixed solid guards seven feet in height and sufficient distance from the moving portion of the elevator so that individuals cannot come in contact with the elevator. If glass is used for guards, they shall be equipped with an electric detection device to prevent car operation in the event the glass breaks or becomes dislodged.

17.02: Machine Rooms, Sheave Rooms and Secondary Levels

(1) All machine rooms shall be located above or below or contiguous to any side of the hoistway.

EXCEPTIONS: Oil hydraulic machine rooms shall be located not more than ten feet from any side of the hoistway.

(2) Machine rooms located above any hoistway shall be provided with a flooring which is either above or level with the top of the machine supporting beams.

(a) Machinery spaces located above any hoistway and containing hoisting or counterweight sheaves directly over the car shall be provided with a flooring located either below the sheaves or level with the top of the sheave supporting beams. Machinery spaces located above any hoistway and containing secondary and deflecting sheaves shall be provided with a flooring if the space also contains other elevator equipment in addition to the sheaves. Where no flooring is provided beneath secondary and deflecting sheaves requiring frequent replenishment of the sheave bearing lubricant means shall be provided for lubricating the sheave bearing from the machine room.

(b) Machine room floors shall be designed to support a uniformly distributed load of not less than 50 lbs. per square foot.

(c) Sheave room or secondary level floors shall be designed to support a uniformly distributed load of not less than 30 lbs. per square foot.

(d) Floors shall be either of concrete construction or of open metal construction which will reject a three-quarter inch ball.

(e) Where holes in flooring for sheaves or groups of ropes are unprotected, they shall be provided with curbing guards not less than four inches high.

(f) Machine room, sheave room and secondary level flooring shall fill the entire top of the hoistway where the cross-sectional area is 150 square feet or less. Where the cross-sectional area is greater than 150 square feet, the flooring shall either fill the entire top of the hoistway or shall extend not less than two feet beyond the general contour of the sheaves, machines, and controllers, and shall also extend to the entrance of the room. Where this flooring does not entirely cover the top of the hoistway, all open or exposed sides of the platform shall be provided with masonry or open metal construction which will reject a ¾ inch ball and not less than six feet high and so designed and supported that when subjected to a pressure of 75 lbs. applied horizontally at any point on the walls of the enclosure, the deflection will not exceed one inch.

(g) Where a section of bar type or other metal cover is part of a machine room floor, it shall conform to the following requirements:

The section shall be installed in a steel frame set flush with the top of the machine room floor.

The cover shall be hinged to the steel frame and shall be equipped with a lock and key which will lock the cover in the closed position. Such cover or grating shall not be made removable.

Exception: Floors are not required above the hoistway of elevators where the machine is located below or at the side of the hoistway and the overhead sheaves are mounted in frames at the sides of the hoistway, provided that:

There is no other equipment, such as selectors, signal machines, etc., exclusive of governors on the same level, and the sheaves are equipped with ball or roller bearings packed in lubricant; or, if they have bearings requiring frequent lubrications, means are provided to lubricate the bearings from the top of the car or the machine room.

(3) Machine room, sheave room, and secondary level enclosures shall be constructed as follows:

(a) Where solid construction hoistways are required by 524 CMR 17.00, the walls shall be of not less than two hour fire-resistive construction other than for doors, windows, louvres, or ventilators.

(b) Where open construction hoistways are permitted by 524 CMR 17.00, the walls shall be of non-combustible materials which shall be either solid construction walls, or open metal construction which will reject a two inch ball, and shall be not less than six feet high.

17.02: continued

(c) Where the machine room is located within the building and where solid construction hoistways are required by 524 CMR 17.00, the ceiling of each machine room shall be of not less than two hour fire-resistive construction.

(d) Where an open construction hoistway is permitted, the machine room ceiling may be omitted.

(e) No machinery, equipment, water lines, drainage lines, or other equipment shall be located in an elevator machine room or hoistway, except that necessary to operate the elevator.

1. Heating and cooling apparatus for the machine room;
2. Pumps for the removal of water from the pit.

(4) Machine room walls shall be not less than two feet from the front and not less than two feet from any side of the hoisting machine.

(5) In the space provided for elevator machinery, the head room above the floor or platform shall be not less than the following:

(a) For elevator hoisting machines -- seven feet.

(b) For secondary sheave spaces housing machinery in addition to the sheaves -- four feet six inches.

(c) For secondary sheave spaces housing no machinery in addition to the sheaves, or for spaces housing other sheaves vertically over the car -- three feet six inches.

Machine and supporting beams may encroach on this headroom in the secondary sheave space provided there is a clearance of not less than two feet six inches between the underside of such beams and the top of the secondary sheave level slab or grating.

(d) Means of access for the inspection, as necessary, of speed governors shall be provided from outside the hoistway, the clear opening to be not less than 30" x 30".

(e) When the speed governor is not accessible from outside the hoistway, a flooring or grating shall be provided.

(f) The access opening shall be provided with a self-closing door equipped with a spring lock that can be opened by hand from the inside of the hoistway. Where solid construction is required doors shall have a fire-resistive construction of not less than one and ½ hours. Where open construction is permitted doors shall be constructed of non-combustible material.

(g) No emergency entrance, or door, or opening for any purpose shall be installed in an elevator hoistway other than that required for the operation of the elevator as required by code regulations.

(h) An enclosed switch or circuit breaker shall be installed in all overhead machinery rooms, sheave rooms, etc. The switch or circuit breaker shall not be bypassed by any other means, shall be located at the entrance to such spaces, and shall comply with 527 CMR 12.00 (Massachusetts Electrical Code now in effect).

(6) Exposed gears, sprockets, tape and rope sheaves, or ropes and tapes passing through the secondary levels shall be equipped with guards.

(7) Each machine room, sheave room or secondary level shall be electrically illuminated with lighting of not less than ten foot candle at the floor level, and each lighting circuit shall be provided with an enclosed type switch located within the room at the lock jamb of the entrance floor.

(8) All machine rooms shall be provided with natural or mechanical ventilation to avoid overheating of the equipment and to insure safe and normal operation of the elevator.

(9) Machine rooms shall be provided with self-closing doors not less than 30" wide by six feet six inches high equipped with spring-locks that can be opened by hand from the inside of the machine room. Where solid construction is required, doors shall have a fire-resistive construction of not less than 1½ hours. Where open construction is permitted, doors shall be constructed of non-combustible material.

Location of controllers for floor mounting: Location of one or a bank of controllers shall have the *minimum* clearance to walls or permanent room partitions. (Such clearances are to "live" panel parts.)

17.02: continued

One or a group of controllers:
1. Front of panel to wall: 30".
2. Back of frame to wall: 24".
3. One side of frame to wall: 18".

(10) Where the entrance to machine rooms and overhead machinery spaces is more than five feet above the adjacent floor or roof surface, and where entrance to secondary sheave levels is through openings in machine room floors and the difference in floor levels is more than five feet, access shall be provided by means of a metal ladder or stairway having an angle not exceeding 60° from the horizontal.

(a) Where the difference in level is over one foot and not over five feet and when the entrance door opens inward, ladders may be vertical, provided the ladder has hand grips at the top to extend above the door opening and is located in the center of the machine room door opening. The rungs on the ladder shall be located not less than ten inches from the wall.

Where the difference in level is one foot or less, no ladder or stairs are required.

(b) Inclined ladders or stairways shall be fitted with a metal handrail above all outside stringers. Vertical ladders shall be fitted with hand grips at the top.

(c) When the entrance door opens outward and is more than three feet above the adjoining roof, a metal or masonry platform shall be provided not more than eight inches below the door sill.

(d) The platform shall be not less than two feet wide and shall project not less than two feet beyond the lockjamb of the door.

(e) A guard rail shall be provided at the edges of this platform. This guard rail shall be not less than 42" high.

(11) Elevator machine rooms shall not be used as public thoroughfares.

(12) All overhead machinery and sheaves shall be supported on steel beams. Controllers, motor generator sets and other auxiliary equipment may be mounted on the machine room or secondary level floor provided the floor is designed to support the imposed static load. Governors may be mounted on machine room or secondary level floors if the floor is designed to withstand the impact load resulting from the application of the car safety device. Supports for machinery and sheave beams shall be of sufficient strength to support the imposed loads and may be building walls or frames.

(13) Supporting beams if used shall be so supported and fastened in place as to effectually prevent same from becoming loose or displaced under the conditions imposed in service.

(14) Loads on overhead beams and their supports shall be computed as follows:

(a) The total load on overhead beams shall be assumed as equal to the weight of all apparatus resting on the beams plus twice the maximum load suspended from the beams.

(b) The load resting on the beams shall include the complete weights of machine, sheaves, controllers, etc. The load suspended from the beams shall include the sum of the tensions of all ropes suspended from the beams.

(15) No elevator machinery, other than the deflector or secondary sheaves or signal devices, shall be fastened to the overhead supporting beams by means of a tension connection.

(16) Where winding drum machines are used, a permanent beam or bar shall be provided at the top of the counterweight guides and beneath the counterweight rope sheaves to prevent the counterweights from being drawn into the sheaves. It shall be of such strength that the ropes will be pulled out of the sockets before there is failure of the beam. The bar or beam shall be located in line with the center of mass of the counterweight, or if more than one stop is used, they shall be located symmetrically with respect to the counterweight.

17.02: continued

(17) The required factor of safety for all steel overhead beams and their supports, based upon both the average ultimate strength of the material and the loads, shall be not less than five.

(18) The allowable deflections of overhead beams and their supports shall be in accordance with the following:

(a) For overhead machine beams of all a.c. installations, and for d.c. installations where the car speed is over 150 f.p.m., the deflection under static load shall not exceed 1/2000 of the span.

(b) For overhead machine beams of d.c. installation, where the car speed is 150 f.p.m. or less, the deflection under static load shall not exceed 1/1666 of the span.

(c) For all overhead sheave beams the deflection under static load shall not exceed 1/1333 of the span.

(d) For overhead beams supporting the machine beams, the deflection under static load shall not exceed 1/1666 of the span.

(19) Heating of Machinery Spaces and Hoistways.

(a) Any source of heat may be used which does not contaminate the air in the above-mentioned spaces, and which does not conflict with any existing health, fire or building ordinance.

(b) Temperature. Any system of heating shall have a capacity to insure a continuous uniform temperature in machinery spaces and hoistways of not less than 50°F and higher as required by the elevator manufacturer's specifications.

(c) Machine rooms shall be provided with natural or other means of ventilation to avoid overheating of the electrical equipment and to insure safe operation of the elevator, with the temperature not to exceed 90°F.

17.03: Venting of Hoistways

(1) Required Venting. Hoistways of all elevators regardless of height shall be provided with means for venting smoke and hot gases to the outer air in case of fire.

(2) Location of Vents. Vents shall be located:

(a) In the side of the hoistway enclosure directly below the floor or floors at the top of the hoistway, and shall open directly to the outer air or through noncombustible ducts of two-hour fire-rated construction to the outer air; or,

(b) In the wall or roof of the penthouse or overhead machinery space above the roof, provided that openings of at least equivalent area are provided in the floor or floors at the top of the hoistway.

(3) Area of Vents. The area of the vents shall be not less than 3½% of the area of the hoistway nor less than three square feet for each elevator car, whichever is greater. Of the required vent area, not less than ⅓ shall be of the permanently open type.

Exceptions: Where mechanical ventilation providing equivalent venting of the hoistway is provided in the overhead elevator machine room (see 524 CMR 17.02(8)), required vent area may be reduced subject to the following:

(a) The building is not a hotel, apartment house, hospital, or similar building with overnight sleeping quarters;

(b) The machine room is so located that it has no outside exposure;

(c) The hoistway does not extend to the top story of the building;

(d) The machine room exhaust fan is automatically reactivated by thermostatic means.

(e) Normally open dampers may be installed actuated by a heat or smoke sensor.

(4) Closed Vents. Closed portions of the required vent area shall consist of windows, skylights, or duct openings glazed with plain glass not more than ⅛" thick.

(5) Window and Skylight Frames and Sash. Window and skylight frames and sash shall be of metal.

17.03: continued

(6) Skylight Guards. A guard, securely anchored to the supporting structure, consisting of a wire-mesh screen of at least #13 steel wire gauge with openings which will reject a ball one inch in diameter, or an expanded metal screen of equivalent strength and open area, shall be installed above every elevator skylight. A similar screen of at least #18 steel wire gauge, or of expanded metal of equivalent strength and open area, shall be installed below every elevator skylight.

(7) Windows. All windows in hoistway enclosures are prohibited.

17.04: Clearance and Pits

(1) Horizontal.

(a) The clearance between a hoistway enclosure and a loading side of the car platform opposite a car opening shall not be more than the following:

Seven inches where pass type vertical biparting counterbalanced doors are installed wholly within the hoistway.

Five inches for all others.

(b) The clearance between the sill of the car and the threshold of the landing shall be not less than ¾" nor more than 1½".

(c) There shall be a clearance of not less than ¾" between cars and the hoistway enclosures and a clearance of not less than one inch between cars and their counterweights.

(d) There shall be a clearance between elevator counterweights and the hoistways of not less than ¾ inch.

(e) If two or more cars are operated in adjacent hoistways, the clearance between cars shall be not less than two inches.

(f) All recesses or offsets in hoistways which are opposite a car opening shall be protected by substantial curtain walls, grating or vertical bars of the fixed type. They shall be firmly secured set on a flush line with the general surface of the hoistway. The distance between the vertical members shall not exceed four inches.

(g) Sides not used for loading and unloading recesses other than for windows or recesses necessary for elevator equipment shall not be permitted. Beams, floor slabs or building equipment construction shall not project more than two inches inside the general line of the hoistway unless the top surface of the projection is beveled at an angle of not less than 75° with the horizontal. Where setbacks occur in the enclosure wall, the top of the setback shall be beveled at an angle of not less than 75° from the horizontal. The maximum clearance between the car and the hoistway shall not exceed four inches other than space necessary for elevator equipment. Separator beams between elevators are not required to have bevels.

(2) Vertical Bottom Clearances.

(a) A pit shall be provided at the bottom of every power elevator hoistway. The pit shall be not more than the sufficient depth necessary to contain the buffers, unless the elevator does not serve the lowest floor. The pit shall be of sufficient depth to contain the buffers, compensating ropes sheaves (if any) and any other equipment necessary for the safe and satisfactory operation of the elevator and to provide the following minimum vertical clearance between the car the counterweight and their buffers when the car is at the bottom and top landing respectively:

Not less than six inches where oil buffers are used or where spring buffers are used with "generator field control".

Not less than 12" where spring buffers are used with "rheostatic control" for contract speeds of 100 f.p.m. or less. Not less than 18" where spring buffers are used with "rheostatic control" for car speeds of from 101 to 200 f.p.m.

(b) The floor of the pit shall be of concrete and approximately level. Where structural conditions make it essential, trenches or depressions may be provided for the installation of buffers and compensation sheaves located in the pit.

17.04: continued

(c) The clear vertical distance between the underside of the car platform or between the underside of any equipment attached thereto, exclusive of the car frame channels, car safety blocks, guide shoes and any aprons or guard attached to the car sill, and the pit floor when the car rests on the fully compressed buffer shall be not less than two feet. In measuring this clearance the depth of any trenches or depressions in the pit floor shall not be included.

(3) Vertical -- Top Clearances. The top clearances for power passenger and freight elevators shall be as follows:

(a) Car Clearance. When the car is at its top landing, the clear distance between the top of the crosshead of the car and the corresponding point of any obstruction or equipment in the hoistway vertically above it shall be not less than the sum of the following four items:

The clearance between the counterweight buffer and its striker block.

The stroke of the counterweight buffer used.

Two feet.

½ the distance required to stop the car from 115 lbs. of contract speed with a retardation of 32.2 feet per second. This item may be omitted if provision is made to eliminate the jump of the car at counterweight buffer engagement.

When any equipment on the car projects more than two feet above the car crosshead, the minimum overhead car clearances required shall be increased by the amount by which this projection exceeds two feet.

(b) Counterweight Clearance. When the car floor is level with the bottom landing, the clear distance between the top of the counterweight assembly and the corresponding point of any obstruction or equipment in the hoistway vertically above it shall be not less than the sum of the following items:

1. The clearance between the top of the car buffer, and its striker block.
2. The stroke of the car buffer used
3. Six inches where oil buffers are used, and 12 inches where spring buffers are used.
4. ½ the distance required to stop the car from 115% of contract speed with a retardation of 32.2 feet per second. This item may be omitted if provision is made to eliminate the jump of the counterweight at car-buffer engagements.
5. Where the car precompresses the buffer, the total stroke of the buffer minus the precompression shall be added in lieu of 524 CMR 17.04(3)(b)1. and 2.

(4) Access to Pits. Safe and convenient access shall be provided to all pits, and shall conform to the following:

(a) Access may be by means of the lowest hoistway door or by means of a separate pit access door.

(b) Access to pits extending more than four feet below the sill of the pit access door shall be provided by means of fixed vertical ladders of noncombustible material, located within reach of the access door. The ladder shall extend not less than 30 inches above the sill of the access door, or handgrips shall be provided to the same height.

(c) Pits shall be accessible only to authorized persons.

Where a separate pit access door is provided, it shall be self-closing and provided with a spring type lock arranged to permit the door to be opened from inside the pit without a key. Such doors shall be kept locked and electrically contacted.

(d) Where a separate pit access door is provided and where fixed ladders are required, a separate door and ladder shall be provided for each elevator hoistway, where one or more elevators are located in the same hoistway.

(5) Illumination of Pits. A permanent lighting fixture shall be provided in all pits, which shall provide an illumination of not less than five foot candles at the pit floor. A light switch shall be provided and shall be so located as to be accessible from the pit access door or adjacent to the pit access ladder and the bulb shall be guarded.

17.05: Hoistway Guards

(1) Counterweight Runways. Counterweight runways of power elevators located in the elevator hoistway shall be enclosed from a point 12" above the floor of the pit to a point at least seven feet above the floor of its own pit and any other pit adjacent to such counterweight runway, other than where compensating chains or ropes which practically compensate for the weight of the hoisting ropes are attached to the counterweight. In this case, counterweight enclosures shall not be required on the side facing the elevator.

(2) Adjoining Hoistways. Where two or more hoistways are located in the same hoistway and where the pit floors of adjacent elevators are located at different levels exceeding two feet, a hoistway guard extending from the floor of each higher pit to a height of not less than seven feet above the floor of such higher pit shall be provided to separate all hoistways adjoining each other. Where the difference in level is two feet or less, a metal railing 36" high may be installed in lieu of the guard.

(3) Landing Sill Guards.

(a) Under the following conditions, all elevator landing sills shall be guarded on the underside with smooth metal guard plates of not less than No. 14 U. S. Gage (0.078125 in.) extending the full width of the car entrance, securely fastened in place as follows:

(b) Where a car levelling or inching device is provided and the hoistway edge of the sill is either flush with or projects into the hoistway, the guard shall have a straight vertical face extending below the sill not less than the depth of the levelling or inching zone plus three inches, provided that where the sill projects inward from the general line of the hoistway the bottom of the guard shall also be bevelled at an angle of not less than 75° with the horizontal or the guard shall be extended from the hoistway edge of the landing sill to the soffit of the hoistway landing door next below.

(c) Where no car levelling or inching device is provided and the sill projects inward from the general line of the hoistway, the guard shall either be bevelled at an angle of not less than 75° with the horizontal or it may have a straight vertical face extending from the hoistway edge of the landing sill to the soffit of the hoistway landing door next below.

(d) Where vertical bi-parting counterbalanced landing doors are provided, the landing sill guards may be omitted provided that, where the trucking sills of such doors project inward from the hoistway face of the door, the lower edge of the trucking sill is equipped with a guard having an angle of not less than 60° with the horizontal.

(4) Soffits of Other Projections. The soffits of all other projections other than door interlocks or contacts, door operating devices, and indicator and signal devices which extend into the hoistway and which are opposite a car entrance, shall be guarded on the underside with smooth metal guard plates of not less than No. 14 U. S. Gage (0.078125 in.) having an angle of not less than 75° with the horizontal.

(5) Hoistway Guard. Hoistway Guard shall be building walls, solid or latticed partitions, grille work, metal gratings or expanded metal with smooth edges, as follows:

(a) Where wire grille work is used, the wire shall be not less than No. 13 Steel Wire Gage (0.0915 in. diam.) and the mesh shall be not more than two inches.

(b) Where expanded metal is used, its thickness shall be not less than No. 13 U. S. Gage (0.094 in.).

(c) The spacing between bars shall be not more than two inches, other than where used as "furring" material, in which case the spacing between bars or slats shall be not more than four inches.

(d) Where sheet metal is used it shall be not less than No. 14 U. S. Gage.

(e) Where building walls are used, they shall be of not less than two hour fire-resistive construction.

(6) Rope Enclosures. Where ropes pass through floors on the outside of the hoistway, they shall be enclosed completely from floor to ceiling at all floors with solid enclosure to not less than two hour fire resistive construction.

17.05: continued

(7) Hoistway not to Lowest Floor. If a hoistway does not extend to the lowest floor of a building, and the space under the bottom of the hoistway is used for any purpose, the following conditions shall exist:

(a) Buffers shall be provided.

(b) The cars and counterweights shall be provided with safety devices.

(c) There shall be a structure under the hoistway sufficiently strong to withstand without failure the impact of the car with contract load or the impact to the counterweight when either is descending at contract speed or at governor-tripping speed where a governor-operated safety is used.

17.06: Pipes and Wiring

(1) No pipes, ducts, vessels, electrical conduits or cables shall be located within an elevator hoistway or its pit other than those used to furnish or control power, light, heat, communications or signals for the elevator or hoistway, or for low voltage fire detection systems for the hoistway.

Sprinklers shall not be installed in the elevator machine room, hoistway, or pit.

(2) The fixed electrical conductors installed in elevator or counterweight hoistway, machine room and pit shall be encased in rigid metal conduits or electrical metallic tubing. Flexible conduits or armored cables may be used between fixed conductors and limit switches, interlocks, push buttons and similar devices.

(3) The traveling electrical conductors connecting the car to the fixed wiring in the hoistway shall have a flame retardant and moisture resistant outer cover.

(4) Pipes, conduits and armored cables shall be securely fastened to the hoistway construction.

(5) Pressure in steam pipes shall not exceed 15 lbs. above atmospheric pressure.

(6) No pipes, ducts or vessels conveying gases or liquids shall be discharged or vented into the hoistway.

(7) No part of any electric circuit having a rated system or circuit voltage in excess of 250 volts shall be used either for any operating circuit or for any control circuit or any equipment which is located in the hoistway, on the car, on the landing doors, or at the landing openings. Circuits of rated system in excess of 250 volts may be used in machine rooms for the operation of motors and for generators, provided that wiring subject to such higher voltage is thoroughly insulated from all other wiring.

(8) All live parts of electrical apparatus in elevator hoistways shall be suitably enclosed to protect against accidental contact. Metal coverings shall be permanently grounded. All wiring for electricity shall be done in accordance with the best practice.

In case any question arises as to what is the best practice, work done according to the requirements of 527 CMR 12.00 (the Massachusetts Electrical Code 12.00) shall be considered as so done.

17.07: Hoistway Doors: General

(1) All landing openings in power-elevator fire-resistive hoistways shall be provided with doors, panels or fronts of not less than 1½ hour fire-resistive construction.

(2) All landing opening doors shall provide a clear passage of not less than 6½' in height.

(3)(a) All hoistway doors shall be provided with interlocks.

(b) When landing doors at terminal floors or any other floors are locked "out of service" the elevator shall be equipped with a telephone to the outside on a 24-hour basis.

17.07: continued

(4) No hardware, other than as required for interlocking, indicators, door operators and signal devices, shall extend into the hoistway beyond the line of any landing threshold.

(5) There shall be installed an emergency release system which permits the operation of the car by the operating devices when the hoistway doors are open. It shall be located only at the top and lowest landing if the latter is the normal point of access to the pit. A continuous-pressure key-operated switch shall be located within easy reach of the landing door. This key shall cut out all corridor operating devices and shall permit operation of the car only when all landing doors except the top and lowest landing doors are closed and locked, and shall permit operation of the car only in a zone extending below the top landing for a distance not exceeding the height of the car cab enclosure. The control shall be arranged to limit the travel of the car. The travel of the car shall be limited to not more than five feet above the lowest landing. This key shall not be master-keyed and shall not be operable by any key which will operate locks or devices used for other purposes in the building. The key shall be removable only when the switch is in the "Off" position and shall be available only to licensed elevator mechanics and elevator inspectors.

(a) Operation Requirements of Hoistway Access Switches. The operation of the switch at either access landing shall permit, and may initiate and maintain movement of the car with the hoistway door at this landing unlocked or not in the closed position, and with the car door or gate not in the closed position, subject to the following:

1. The operation of the switch shall not render ineffective the door interlock or electric contact at any other landing.
2. The car cannot be operated at a speed greater than 150 feet per minute.
3. For automatic and continuous pressure operation elevators, provided:

Landing operating devices of continuous-pressure operation elevators, and car and landing operating devices of automatic operation elevators shall be first made inoperative by means other than the access switch.

Power operation of the hoistway door and/or car door or gate is inoperative.

4. Automatic operation by a car-leveling device is inoperative.
5. The top-of-car operating device (see 524 CMR 17.35(10)) is inoperative.

Where electrically operated switches, relays or contacts are used to render inoperative the hoistway door interlock or electric contact or the car door or gate contact, the control circuits shall be arranged to conform to the requirements of 524 CMR 17.10 and 17.14(8), and in addition to render the normal car and hall operation ineffective if any such switch, relay or contactor fails to function in the intended manner.

(6) No keys or devices shall be permitted which will unlock any landing door when the car is not within the landing zone.

(7) Hoistway doors for passenger elevators shall be so arranged that it is not necessary to reach back of any panel, jamb, or sash to operate them.

(8) Hangers for power-operated hoistway doors shall be designed to withstand a downward thrust of five times the weight of the door and an upward thrust of four times the weight of the door.

(9) Means shall be provided to prevent hangers for all sliding hoistway doors from jumping the tracks. Stops shall be either provided to prevent the hanger carriage from leaving the ends of the track or suitable stops shall be provided on the door.

(10) Manually operated or self-closing hoistway doors of the sliding type for elevators with automatic or continuous-pressure operation shall be provided with either one or more vision panels, or a hall position indicator or a hall lantern. All swing-type hoistway doors shall be provided with vision panels. Vision panels may be provided for any type of hoistway door irrespective of the type of operation of the elevator. Where required or used, vision panels shall conform to the following requirements:

(a) The area of any single panel shall not be less than 25 square inches, and the total area of one or more panels in any hoistway door shall be not more than 80 square inches.
(b) Each clear panel opening shall reject a ball six inches in diameter.

17.07: continued

(c) Panels shall be of clear wired glass.

(d) The center of the vision panel for horizontal, slide and swing type doors shall be not less than 54" nor more than 66" above the elevator landing. For vertical bi-parting counterbalanced doors, it shall be located to comply with the dimensions specified insofar as the conditions will permit.

(e) If used for power-operated hoistway doors, the wired-glass panel shall be substantially flush with the surface of the landing side of the door.

(11) Door counterweights shall run in metal guides in such a manner that they cannot become dislodged or shall be boxed in. The bottoms of the guides or boxes shall be so constructed as to retain the counterweight if the counterweight rope breaks.

(12) Power opened hoistway doors shall be equipped with interlocks, operating mechanisms and control systems which are arranged to prevent the opening of all doors in the hoistway other than the door or doors which are located as follows:

(a) At that landing where the car is at rest.

(b) At that landing when the car is coasting through the landing zone with its operating device in the stop position.

(c) At that landing where the car is being moved by the car leveling devices within the landing zone.

(13) Hoistway doors shall be arranged so that they may be opened by hand from the hoistway side unless locked "out of service". Neither the door at the main floor landing or at the top or bottom terminal landing shall be locked "out of service" when the elevator is in service.

(14) Where an elevator is installed in a single blind hoistway, there shall be installed in the blind portion of the hoistway an emergency door at every third floor, which fully protects the opening, but not more than 42' apart, conforming to the following:

(a) The clear opening shall be at least two feet four inches wide and six feet six inches high.

(b) It shall be easily accessible and free from fixed obstructions.

(c) It shall be either of the horizontally sliding type or swinging single section type, irrespective of the type of door installed at other landings.

(d) It shall be self-closing and self-locking with the firefighter's key lock (524 CMR 17.39), and shall be marked in letters not less than two inches high "DANGER - ELEVATOR HOISTWAY."

(e) It shall be provided with an electric contact conforming to this code.

(f) It shall be unlocked from the landing side only through the use of the firefighter's key (524 CMR 17.39).

(g) The key lock shall be so designed that the key shall be removable only in the locked position.

(h) The key shall be kept only by authorized persons.

(15) All landing door frames must be thoroughly grouted to obtain the proper fire rating.

17.08: Landing Doors for Power Passenger Elevators

(1) Automatic Fire Door. No automatic fire door shall lock any landing opening in the hoistway enclosure of any passenger elevator or lock any exit leading from any hoistway landing door to the outside of the building.

(2) Landing Openings. Landing openings in passenger elevator hoistway enclosures shall be protected by horizontal sliding doors, combination sliding and swinging doors, or by swinging doors.

17.08: continued

(3) Certain Measurements. The distance between the hoistway side of the landing door opposite the car opening and the hoistway edge of the landing threshold on elevators which can be operated only from the car shall be not more than four inches. For automatic-operation elevators, the distance between the hoistway side of the hoistway door opposite the car opening and the hoistway edge of the landing threshold, shall be not more than the following:

(a) For swinging doors, ½".
(b) For sliding doors, 2¼".

In no case shall the hoistway face of the hoistway door project into the hoistway beyond the edge of the landing sill. When the hoistway door consists of two or more sections, the distance specified in 524 CMR 17.08(3)(b) shall be measured from the section of the door nearest to the edge of the hoistway landing sill.

17.09: Landing Doors for Power Freight Elevators

(1) Landing Opening. Each landing opening in a freight elevator hoistway shall be equipped with a door set within four inches of the face of the landing threshold.

Bi-parting counterbalanced doors shall have the lower edge of the upper door section provided with a fire-resistive, non-shearing, non-crushing member to provide a spacing of not less than ¾" between the rigid members of the door sections when closed.

Any rigid astragal, locking or latching device overlapping the meeting edge is prohibited.

(2) Types of Landing Doors. Landing doors may be horizontally or vertically sliding, counterbalanced vertically sliding, combination sliding and swinging or swinging type.

(3) Power-Operated Vertical Bi-Parting Counterbalanced Doors. If vertical bi- parting counterbalanced doors are power operated, the landing door shall not start to close until after the car gate is within 12" of full closure, and, on opening, the car gate shall not start to open until the landing door is within 12" of its full open position.

(4) Pull Straps on Manually-Operated Vertically-Sliding Bi-Parting Counterbalanced Hoistway Doors. Manually-operated vertically sliding bi-parting counter-balanced hoistway doors of elevators which can be operated from the landings shall be provided with pull straps on the inside and the outside of the door and shall be located at the lower edge of the upper door section.

The length of the straps shall conform to the following:

(a) The bottom of the straps shall be not more than six feet above the floor when the door is in the fully-opened position.
(b) The length of the straps shall not be extended by means of ropes or other materials.
(c) The length of pull straps where provided on such doors of elevators which can be operated from the car only shall conform to the requirements specified.

(5) Counterbalanced Doors. Single or multisection vertically-sliding doors and vertically-sliding bi-parting counterbalanced doors shall be so counterbalanced that they will not open by gravity. Fastenings shall be provided to prevent the detachment or dislodgement of the counterbalancing weights of doors. Suspension means and their connections for vertically-sliding counterweighted doors shall have a safety factor of not less than five.

17.10: Hoistway Door Interlocks

(1) Interlocks shall be arranged to prevent the operation of the elevator machine by the operating devices in a direction to move the car away from the landing unless all hoistway doors are both closed and locked in the closed position; and the interlock shall not be required to prevent the movement of the car by inching or leveling devices with the hoistway door open.

17.10: continued

(2) The interlock shall prevent the opening of the hoistway door from the landing side unless the car either is at rest within the landing zone or coasting through the landing zone with its operating devices in the stop position.

(3) For automatic operation or continuous-pressure operation, the hoistway door shall not be considered in the closed position until the door is within ⅜" of the nearest face of the door jamb; or, in the case of bi-parting doors, either ⅜" of contact with each other when horizontal sliding doors are used.

(4) For power elevators where the hoistway door is not equipped with a door closer, the door shall be considered in the closed position only when the door is within ⅜" of the nearest face of the door jamb; or, in the case of bi-parting doors, either ⅜" of contact with each other when horizontal sliding doors are used; or two inches of contact with each other when vertical sliding doors are used, and the upper sections of the vertical sliding bi-parting doors are equipped with astragals which close the opening between the door section when the interlock circuit is closed.

(5) Where the hoistway door of an elevator requiring the presence of an operator in the car is equipped with a door closer, the door shall be considered to be in the closed position and the car may be started when the door is within four inches of the nearest face of the jamb; or, in the case of a bi-parting door, when the sections are within four inches of contact of each other, if at this position and any other up to the closed position, the door cannot be opened from the landing side more than four inches from the jamb, or the sections more than four inches from each other in the case of a bi-parting door.

(6) All interlocks for all hoistway doors shall be so designed that the door is locked in the closed position (as defined in 524 CMR 17.10(3), 17.10(4), and 17.10(5) immediately preceding) before the car can be operated by the operating devices. Devices employing locks and contacts of a type in which the interlocking contact is made when the door is closed and the locking of the door takes place subsequently, are not interlocks and are not permitted where interlocks are required under 524 CMR 17.00.

(7) Interlock contacts shall open the operating circuit and shall be positively opened by the locking member. They shall be maintained in the open position by the action of gravity or a restrained compression spring or both, or by means of a positive linkage. The interlock shall hold the door in the locked position by means of gravity or a restrained spring or by both.

(8) Each type and make of door interlock shall be tested and approved on the basis of test conforming to the best engineering practice made by or under the supervision of a competent designated laboratory. Minor changes in design may be made without re-testing, subject to the approval of either the enforcing authority or the testing laboratory. In case any question arises as to what is the best engineering practice, test conforming to the American National Standard Safety Requirements for Elevators, Dumb-waiters, Escalators, and Moving Walks, ANSI A17.1* shall be considered as conforming thereto.

(9) Approved interlocks shall be suitably and plainly marked for identification, the marking to be permanent and so placed as to be readily visible when the interlock is mounted in position. Only one identification marking is required, which shall include the following:
  (a) Manufacturer's name or trademark;
  (b) Type of style letter or number;
  (c) Rated voltage.

(10) The car cam used to actuate any particular interlock shall exert a force at least double the average force, and shall have a movement at least ½" in excess of the average movement, as given in the test certificate for that interlock.

17.10: continued

(11) On all vertical bi-parting doors, means shall be provided to prevent the closing of the interlock circuit by hand when the doors are in the open position.

(12) No electrically released, gravity or spring applied rope gripper or rope-lock shall be used as a component device in any interlock system.

(13) Where required, interlocks, or combination mechanical locks and electric contacts, or electric contacts, and the wiring, shall be so located that they are not accessible from the landing side when the hoistway doors are closed.

(14) All center opening doors shall be equipped with a mechanical and electric interlock on each door.

17.11: Landings for Power Passenger and Freight Elevators

(1) The landing threshold shall be constructed and maintained so that persons will not readily slip thereon.

(2) If there is a railroad track upon any elevator landing, the tops of the rails shall be flush with the floor for a distance of six feet from the threshold.

17.12: Power Operation, Power Opening and Power Closing of Hoistway Doors and Car Doors

(1) Types of Doors and Gates Permitted. Where both a hoistway door and a car door or gate are opened and/or closed by power, the hoistway door and the car door or gate shall:
(a) Both be of the horizontal sliding type.
(b) Both be of the vertically sliding type.

(2) Power Opening of Car Doors or Gates. Power opening of a car door or gate shall be subject to the following:
(a) Power opening shall occur only when the car is stopping, or is leveling, or is at rest.
(b) Collapsible type car gates shall not be power opened to a distance exceeding ⅓ the clear gate opening and in no case more than ten inches.

(3) Power Opening of Hoistway Doors. Power opening of a hoistway door shall conform to the following:
(a) Power opening shall occur only at that landing where the car is stopping, or is leveling, or is at rest, and shall start only when the car is within the landing zone or is within the leveling zone where an automatic car leveling device is provided.
(b) Power opening may be initiated automatically through control circuits provided that the car is being automatically stopped or leveled and provided that, when stopping under normal operating conditions, the car shall be at rest or substantially level with the landings before the hoistway door is in the fully open position.
(c) Sequence opening of a vertically sliding hoistway door and adjacent car door or gate shall be provided.

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* ANSI A17.1, American National Standard Safety Requirements for Elevators, Dumb-waiters, Escalators, and Moving Walks" may be purchased from American National Standards Institute, Inc., 1430 Broadway, New York, N.Y. 10018.

17.12 continued

(4) Power Closing or Automatic Self-Closing of Car Doors or Gates Where Used with Manually Operated or Self-Closing Hoistway Doors. Where a car gate of an automatic or continuous pressure operation passenger elevator is closed by power, or is of the automatically released self-closing type, and faces a manually operated or self-closing hoistway door, the closing of the car door or gate shall not be initiated unless the hoistway door is in the closed position; and the closing mechanism shall be so designed that the force necessary to prevent closing of a horizontally sliding car door or gate from rest shall not be more than 30 lbs.

EXCEPTION: Where a car door or gate is closed by power through continuous pressure of a door-closing switch, or the car operating device, and where the release of the closing switch or operating device will cause the car door or gate to stop or to stop and reopen.

(5) Power Closing of Hoistway Doors and Car Doors or Gates by Continuous Pressure Means. Horizontally or vertically sliding hoistway doors with manually closed or power operated or power closed car doors or gates may be closed by continuous pressure means, subject to the following:

(a) The release of the closing means shall cause the hoistway door and a power-operated or power-closed car door or gate to stop or to stop and reopen.

(b) The operation of the closing means at any landing shall not close the hoistway door at any other landing nor the car door or gate when the elevator car is at any other landing.

(c) For elevators having more than one hoistway opening at any landing level, a separate closing means shall be provided in the car for each car door or gate and its adjacent hoistway door. Any closing means at a landing shall close only that hoistway door and the car door or gate at the side where such means is located.

EXCEPTION: A separate closing means need not be furnished for a horizontally sliding hoistway door and adjacent car door or gate which conform to the requirements of 524 CMR 17.12(8).

(d) Sequence closing of a vertically sliding hoistway door and adjacent car door or gate shall be provided where required by 524 CMR 17.12(10).

(6) Power Closing of Horizontally Sliding Hoistway Doors and Horizontally Sliding Car Gates by Momentary Pressure or by Automatic Means. Power closing by momentary pressure or by automatic means shall be permitted only for automatic or continuous pressure elevators. The closing of the doors shall be subject to the following:

(a) It shall conform to the requirements of 524 CMR 17.12(8).

(b) A momentary pressure switch shall be provided in the car, the operation of which shall cause the doors to stop or to stop and reopen.

(7) Power Closing of Vertically Sliding Hoistway Doors and Vertically- Sliding Car Doors or Gates by Momentary Pressure or by Automatic Means. Power closing by momentary pressure or by automatic means shall be permitted only for automatic or continuous pressure elevators. Vertically sliding hoistway doors used with vertically power-operated car doors or gates may be closed by momentary pressure or automatic means, subject to the following:

(a) A warning bell or other audible signal shall be provided on the car which shall start to sound at least five seconds prior to the time the car door or gate starts to close and shall continue to sound until the hoistway door is substantially closed.

EXCEPTION: The five-second time interval may be omitted when the doors are closed by a closing switch in the car.

(b) Sequence closing of the hoistway door and adjacent car door or gate shall be provided and shall conform to the requirements of 524 CMR 17.12(10).

(c) The car door or gate shall be equipped with a reopening device conforming with the requirements of 524 CMR 17.12(9).

(d) A momentary-pressure type switch shall be provided in the car and at each landing, which when operated shall cause the car door or gate and the hoistway door at the landing to stop or to stop and reopen.

17.12: continued

(e) The average closing speed shall not exceed one foot per second for a vertically sliding counterweighted hoistway door or for each panel or section of a bi-parting counterbalanced hoistway door or car gate, and shall not exceed two feet per second for a vertically sliding counterweighted car door or gate.

(8) Kinetic Energy and Force Limitations for Power Door Operators Used with Horizontally Sliding Hoistway Doors and Horizontally Sliding Car Doors or Gates. Where a power operated horizontally sliding hoistway door is closed by momentary pressure or by automatic means (see 524 CMR 17.12(6)) or is closed simultaneously with another door from one continuous pressure means (see 524 CMR 17.12(5)(c)), the closing mechanism shall be designed and installed to conform to the following requirements:

(a) The kinetic energy of the hoistway door and all parts rigidly connected thereto, computed for the average closing speed, shall not exceed seven foot pounds where a reopening device for the power-operated car door or gate conforming to the requirements of 524 CMR 17.12(9) is used, and shall not exceed 2½ foot pounds where such door reopening device is not used. Where the hoistway door and the car door or gate are closed in such a manner that stopping either one manually will stop both, the sum of the hoistway and the car door weights as well as all parts connected rigidly thereto shall be used to compute the kinetic energy. The average closing speed shall be determined by timing the closing door as follows:

1. With single-slide and two-speed doors, determine the time required for the door to travel from a leading edge of the point two inches away from the open jamb to a point six inches away from the opposite jamb.

2. With center-opening or two-speed center-opening doors, determine the time required for the leading edge of the door to travel from a point one inch away from the open jamb to a point one inch from the center meeting point of the doors.

(b) The force necessary to prevent closing of the hoistway door (or the car door or gate if power operated) from rest shall be not more than 30 lbs.

(9) Reopening Device for Power Operated Car Doors or Gates. Where required by 524 CMR 17.12(7)(c) or 17.12(8), a power operated car door or gate shall be provided with a reopening device which will function to stop and reopen a car door or gate and the adjacent hoistway door in the event that the car door or gate is obstructed while closing. For center opening doors the reopening device shall be so designed and installed that the obstruction of either door panel when closing will cause the reopening device to function.

(10) Sequence Operation of Power Operated Hoistway Doors with Car Doors or Gates.

(a) Where Required. Sequence operation shall be provided under the following conditions:

Sequence opening and closing shall be provided for power operated vertically sliding bi-parting counterbalanced or power operated vertically sliding hoistway doors which slide down to open where used on passenger elevators or on freight elevators permitted to carry employees. (See 524 CMR 17.15(4) in conjunction with power operated vertically sliding car door or gate).

EXCEPTION: Doors at openings used exclusively for freight.

(b) Operating Requirements. The sequence operation of a hoistway door and adjacent power operated vertically sliding car door or gate shall conform to the following:

1. In opening, the hoistway door shall be opened at least ⅔ its travel before the car door or gate can start to open.

2. In closing the car door or gate shall be at least ⅔ its travel before the hoistway door can start to close.

17.13: Car Construction

(1) Car suspension frames and platform frames of passenger and freight elevators, and platform stringers of freight elevators shall be constructed of steel meeting not less than the requirements of specification A7 of the ASTM.

17.13: continued

(2) The stresses of rolled steel sections or annealed cast steel used in the construction of car frames and platforms based on the static load imposed on them, including the weight of the unloaded car and the maximum rated carrying capacity, shall not exceed the values given in Table 1 in 524 CMR 17.13 for passenger cars and Table 2 in 524 CMR 17.13 for freight cars.

TABLE 1.

ALLOWABLE STRESSES FOR PASSENGER CAR-FRAME AND PLATFORM MEMBERS

Loading	Maximum Allowable Stress (lb. per sq. in.)		Basis
Tension	10,000	____	Net area
Bending	10,000	____	Gross section
Shear on shop rivets	8,000	____	Net area
Bearing on shop rivets	16,000	____	Net area
Shear on bolts in clearance holes	7,000	____	Gross section
Bearing on bolts in clearance holes	14,000	____	Gross section
Bolts or threaded portions of rods in tension	6,000	____	Net area
Compression	11,700 __	49L/R	Gross area

L = effective free length of member in inches
R = least radius of gyration in inches

TABLE 2.

ALLOWABLE STRESSES FOR FREIGHT CAR-FRAME AND PLATFORM MEMBERS

Loading	Maximum Allowable Stress (lb. per sq. in.)		Basis
Tension	12,000	____	Net area
Bending of car frame member and platform framing at entrance	12,000	____	Gross section
Bending on platform stringers	15,000	____	Gross section
Shear on shop rivets	9,500	____	Net area
Bearing on shop rivets	19,000	____	Net area
Shear on bolts in clearance holes	8,000	____	Gross section
Bearing on bolts in clearance holes	16,000	____	Gross section
Bolts or threaded portions of rods in tension	8,000	____	Net area
Compression	14,000 __	59L/R	Gross section

L = effective free length of member in inches
R = least radius of gyration in inches

The stresses tabulated above are based on steels having an ultimate strength from 55,000 to 65,000 lbs. per sq. inch for rolled sections or cast steel and 46,000 to 56,000 lbs. per sq. inch for rivets. For steels of greater ultimate strength, the allowable stresses may be increased proportionately.

(3) No cast iron shall be used in the construction of any member of the car frame or platform subject to tension or bending. Cast iron may be used for compensating cable anchorages, releasing carriers and guideshoe stands.

17.13: continued

(4) The deflection of crosshead and safety plank shall not exceed ⅛" in each ten feet of span under static conditions with contract load substantially uniformly distributed over the car platform.

(5) The slenderness ratio L/R for members not normally subject to compression shall not exceed 250; for members normally subject to compression this ratio shall not exceed 120. Loading resulting from buffer and safety operation shall not be considered normal loading.

(6) No glass shall be used in freight elevators except to cover certificates, lighting fixtures, vision panels and appliances necessary for the operation of the car.

(7) There shall be no obstructions or projections in the car floor.

(8) Where platform floors are constructed of wood or other combustible materials they shall be covered on the underside with sheet metal of not less than No. 27 U. S. Gage thickness.

(9) Elevators provided with car leveling or inching devices shall have their platforms provided with a metal guard not less than No. 16 U. S. Gage in thickness. This guard shall extend horizontally the full width of the car entrance and vertically below the car floor for not less than the depth of the levelling or inching zone plus three inches. The lower edge of the guard shall be beveled at an angle of not less than 70° with the horizontal.

(10) The requirements for loading classifications will be found in 524 CMR 33.00. Satisfaction as to compliance will be evidenced by the manufacturer's certificate.

(11) Welding of parts upon which safe operation of all equipment contained in 524 CMR depends shall be done by qualified welders; and all work upon completion shall be approved by the enforcing authority before the elevator, escalator, dumbwaiter, etc., is placed in service.

Exception: Tack welds not later incorporated into finished welds carrying calculated loads.

17.14: Car Enclosures

(1) General.

(a) Each power passenger or freight elevator car shall be fully enclosed on top and at all sides other than above the top of a power freight elevator car gate.

(b) The car enclosure shall be secured to the car platform and sling in such a manner that it cannot work loose or become displaced in ordinary service.

(c) No part of a car enclosure shall deflect either so as to reduce the minimum clearances specified in 524 CMR 17.04 or more than one inch when subjected to any single horizontally applied force of 75 lbs.

(d) Means for ventilating shall be provided for all cars with solid enclosures and solid doors.

(e) No elevator shall have more than two entrances.

(f) No elevator shall have more than one compartment.

(g) Glass exceeding one square foot in area may be used in passenger elevator cars.Such glass shall:

1. Be laminated type glass and properly secured;
2. Meet all requirements, except as to transparency, as provided in Reference Codes ANSI Z97.1 - 1966 Edition, and all future ANSI codes, standards, and specifications;
3. Be installed so as to provide adequate protection for passengers in the event the glass panels break or are dislodged. Said protection shall consist of electrical supervision or detection which will cause the elevator car to shut down in the event of glass breakage. The breakage shall initiate the alarm system;
4. Be so mounted in the structure that the structure, including the glass in place, shall withstand without damage all required elevator tests.

17.14: continued

EXCEPTIONS: Passenger elevators or freight elevators may have two compartments, one of which is located immediately above the other provided the compartmented elevator conforms to the following requirements:

(a) The elevator shall be used exclusively for passengers or exclusively for freight at any one time.

(b) Each compartment shall conform to the requirements of 524 CMR 17.00 except that a trap door in the floor of the upper compartment shall provide access to the top emergency exit for the lower compartment.

(c) Where either or both compartments are intended for passenger service, the minimum rated load for each compartment shall conform to the requirements of 524 CMR 17.15.

Where one compartment is intended for freight use, its minimum rated load shall conform to the requirements of 524 CMR 17.15 or shall be based on the freight loads to be handled, if greater than the minimum rated load requirement.

Where both compartments are used exclusively for freight, the minimum rated load of each compartment shall conform to the requirements of 524 CMR 17.15(3).

The rated load of the elevator shall be the sum of the rated loads of the individual compartments.

(d) An emergency stop switch conforming to the requirements of 524 CMR 17.35(6) and 17.35(7) shall be provided in each compartment, and these emergency stop switches shall be so connected that the car cannot run.

(e) All hoistway doors shall be closed and locked and the car doors for each compartment closed before the car can be operated.

(2) Power Passenger Elevator Car Enclosures, Sides and Top.

(a) Power passenger elevator car enclosures shall be either of metal, fire-retardant wood or equally fire-retardant materials provided that untreated wood or materials of equivalent combustible characteristics may be used if covered with sheet metal not less than No. 27 U. S. Gage (0.0172 inch) or equivalent approved non-combustible material applied directly to all exterior surfaces of the enclosure. Thin finishes or linings of materials not more than 1/20 inch in thickness, having no greater fire hazard than paper and securely bonded to non-combustible panels, shall be permitted on the interior of the car.

Slow-burning combustible materials for insulating, sound deadening or decorative purposes may not be used for lining enclosures, whether smooth, padded, of tufted. Light diffusers shall be of metal.

(b) Openings in an enclosure, other than as required for entrance, vision panels, emergency exit, and ventilation, are prohibited.

(c) Ventilating openings less than seven feet above the car platform shall reject a ball two inches in diameter.

(d) No cast iron shall be used for car tops.

(e) Each passenger elevator car shall be of solid construction and designed and installed to be capable of sustaining a load of 300 lbs. on any square area two feet on a side and 100 lbs. applied at any point. Simultaneous application of these loads is not required.

(f) Smoking or carrying a lighted pipe, cigar, cigarette or other ignited smoke or flame carrying device in a passenger elevator shall be prohibited.

(g) There shall be a sign installed or posted in the car above or adjacent to the control push button or signal push button for car switch operation. These sign plates shall be of metal and shall have letters stamped or etched on the surface of the plate in such a manner as to be readily legible. The minimum size of the sign shall be 3¼" by 2¼". The lettering shall be on a white back- ground and shall read and be sized as indicated below:

In case of. . . . . . . .⅛" equals 14 point lettering Color: Black
Fire. . . . . ⅜" equals 30 point lettering Color: Red
In This Building. . . . .⅛" equals 14 point lettering Color: Black
Use Exit Stairways. . . 3/16 inch equals 16 point lettering Color: Red
Do Not Use This Elevator ⅛" equals 14 point lettering.Color: Black

17.14: continued

(3) Power Passenger Elevator Car Emergency Exits.

(a) Each power passenger elevator car shall be provided with an emergency exit in the top of the car.

(b) In addition to the top emergency exit, whenever there is an adjacent elevator which is not more than two feet six inches away and without intervening hoistway partitions, counterweights, or similar obstruction, a side emergency exit may be provided in each car to permit emergency passage to each adjacent car.

(c) Top emergency exit panels shall:

be not less than 400 sq. inches in area;

measure not less than 16" on any one side.

The exit panel shall open outward and shall be so hinged or otherwise attached to the car top that the panel can be opened from the top of the car only. At no time shall the panel project beyond the line of the car top and shall be arranged so that no equipment mounted in or on the car top obstructs a clear passageway.

NOTE: The exit cover shall be kept in the closed position when not in use by a manually operated self-locking latch or bolt without the use of keys or tools. A handle shall be attached to the top of the exit frame for convenience in opening.

(d) Side emergency exit panels if installed shall:

be of the hinged type, open only into the car;

be not less than 16" in width;

be extended from the floor or base moulding up to the soffit moulding and in no case less than five feet in height;

be located where passage of persons is not obstructed by car frame members or by fixed hoistway equipment;

be provided with a lock arranged so that the door may be opened from inside the car by means of a removable key and from the outside of the car by means of a non-removable handle. Keys shall be located as follows:

for automatic operation elevators in a receptacle with a transparent breakable cover suitably marked and located at the landing of each elevator or group of elevators that is nearest the main entrance to the building;

for elevators having other types of operation, in the car;

be provided with an electric contact which shall prevent the operation of the car by the operating devices when the panel is open on all automatic operation or continuous pressure operation elevators which may be operated from both the car and the landings.

NOTE: See 524 CMR 17.23(10) "EXCEPTION" regarding the side door on oil hydraulic elevators.

(4) Power Passenger Elevator Car Doors.

(a) Cars of passenger elevators which can be operated from the car only and cars of automatic operation passenger elevators shall be provided with a horizontal door or horizontal gate at each entrance as follows:

Elevators installed in new hoistways shall be provided with horizontal car doors.

Elevators installed in existing hoistways where space conditions do not permit the installation of car doors may be provided with horizontal gates.

(b) The car door or gate when closed shall guard the full opening, and each door or gate shall be provided with a car door or gate electric contact. Car gates where permitted shall be of a design which will reject a ball three inches in diameter and shall be so guided top and bottom and of such strength as not to deflect past the line of the car sill when subjected to a force of 100 lbs. applied horizontally at any point. Collapsible type power gates shall not be power opened for a space in excess of nine inches from full closure.

(c) Car doors for passenger elevators, employing a type of operation which does not require the presence of an operator in the car and which are closed by power other than by hand, shall be driven by a mechanism so designed and set that the force necessary to prevent the closing of the door shall not exceed 30 lbs. The kinetic energy of the door plus all parts connected rigidly thereto, computed for the average closing speed, shall not exceed five foot-pounds. Where the same mechanism also closes the hoistway door, the total kinetic energy shall not exceed seven foot-pounds.

17.14: continued

(d) All power operated car doors and gates shall be provided with a reopening device which will function to stop and reopen the car door or gate and the adjacent hoistway door, in the event that the car door or gate is obstructed while closing.

For center opening doors the reopening shall be so designed and installed that the obstruction of either door panel when closing will cause the reopening device to function.

(e) For automatic-operation passenger elevators having power closed or automatically released, self-closing car doors and manually closed or self-closing hoistway doors, the closing of the car door shall be delayed until the hoistway door is in the closed position.

(f) Each car door for power passenger elevators may be provided with wired glass panels not to exceed a width of six inches and a height of 24".

(g) Sliding car doors shall operate in guides.

(h) Hangers for power-operated car doors shall be designed to withstand a downward thrust of five times, and an upward thrust of four times, the weight of the door.

(i) Each car door or gate shall be provided with a car door or gate electric contact.

(5) Power Freight Elevator Car Enclosure Sides and Top.

(a) Freight elevator car sides shall be of solid metal construction to a height of not less than six feet above the car platform. Above six feet, car sides other than that section opposite a counterweight shall be extended to the car top or crosshead and shall be of solid metal construction or of perforated metal or of wire mesh not less than No. 13 Steel Wire Gage construction which will reject a ball 1½" in diameter. The section of the car enclosure opposite a counterweight shall be extended to the car top or crosshead and shall be of solid metal construction.

(b) Each freight elevator car top shall be of solid construction or open metal construction which will reject a ball 1½" in diameter, capable of sustaining a load of 300 lbs. on any square area of two feet on each side or 150 lbs. applied on any spot.

(c) Where sheet metal is used, it shall be equal in strength and stiffness to not less than No. 14 U. S. gage sheet metal (0.078 inch).

(d) The front section of each freight elevator car top shall be hinged along a line not less than 18" from the front of the car or an emergency top exit shall be provided.

(6) Power Freight Elevator Car Doors or Gates.

(a) A car door or gate shall be provided at each entrance to power elevator freight cars.

(b) Each door or gate shall be provided with a car-door or gate electric contact, or with an interlock.

(c) Car gates for freight elevators when closed shall guard the full width of the opening, and they shall be not less than six feet high.

(d) If vertical bi-parting counterbalanced doors are power operated, the landing door shall not start to close until after the car gate is within 12" of full closure and, on opening, the car gate shall not start to open until the landing door is within 12" of its full open position.

(e) Collapsible gates when fully expanded shall reject a ball 4½" in diameter. Vertical lifting type car gates shall be of a design to reject a ball two inches in diameter.

A gate made in two or more parts which slide or telescope by each other in the same direction may be used if the gate is solid or if the openings are ⅜" square or smaller, and if the edges of adjacent parts of the gate always lap so that the danger of injury due to shear is eliminated.

(f) A weight used to close automatically or counterbalance a car door or gate shall run in metal guides from which it cannot become dislodged, or it shall be boxed in. The bottoms of the guides and boxes shall be so constructed as to retain the weight if the suspension member breaks.

(g) Sliding car doors for power freight elevators may be solid, may be provided with open grille or bars which shall reject a ball two inches in diameter, and may be provided with glass vision panels. Grilles or bars may extend the full height of the door panel.

(h) Sliding car doors or gates shall operate in guides.

(i) Hangers for power operated car doors shall be designed to withstand a downward thrust of five times, and an upward thrust of four times, the weight of the door.

17.14: continued

(7) Location of Power Passenger and Power Freight Car Doors and Gates. Doors or gates for automatic or continuous-pressure operation elevators shall be so located that the distance from the face of the car door or gate to the face of the hoistway door shall be not more than the following:

(a) Where a swing-type hoistway door and a car gate are used -- four inches.
(b) Where a swinging-type hoistway door and a car door are used -- 5½.
(c) Where a sliding-type hoistway door and a car gate or door are used -- 5½.
The distance specified shall be measured as follows:
1. Where multi-section car and hoistway sliding doors are used, or where one of these doors is multi-section and the other is single-section, between the section of the two doors nearest to each other.
2. Where a multi-section car door and a swinging-type hoistway door are used, between the hoistway door and the section of the car door farthest from it.
3. Where a car gate is used, between the car gate and that section of the hoistway door nearest to the car gate.

(8) Power Elevator Car Door or Gate Electric Contact.
(a) The electric contact of the car door or gate, other than when the car is being operated by inching or levelling devices, shall prevent the operation of the car by the operating devices unless the door or gate is in the closed position.
(b) Horizontal sliding type doors or gates shall be considered in the closed position when the clear open space between the edge of a door or gate and the nearest face of the jamb does not exceed two inches. Where the car gate is the vertical slide type, the gate shall be considered in the closed position when the lower horizontal member of the gate is not more than three inches above the car sill. Where the car door or gate of an elevator that can be operated from the car only is provided with a door closer, the electric contact on the car door or gate may permit the starting of the car when the clear open space does not exceed four inches.
(c) The car door or gate contact shall be located so that it is not normally accessible to a person standing on the car platform.
(d) Car door or gate contacts shall open the operating circuit and shall be positively opened by a lever or other device attached to and operated by the door or gate. Contacts shall be maintained in the open position by gravity or a restrained spring or both, or by means of a positive linkage.
(e) Each type and make of contact shall be tested and approved on the basis of tests conforming to the best engineering practice made by or under the supervision of a competent designated laboratory. Minor changes in design may be made without retesting, subject to the approval of either the enforcing authority or the testing laboratory. In case any question arises as to what is the best engineering practice, tests conforming to the American Standards Safety Code for Elevators (No. A17) shall be considered as conforming thereto. Such contacts shall be suitably marked for identification.

(9) Platform Guards (Aprons). The entrance side of the platform of passenger and freight elevators equipped with leveling devices or truck-zoning devices shall be provided with smooth metal guard plates of not less than No. 16 U.S. gage steel, or material of equivalent strength and stiffness, adequately reinforced and braced to the car platform and conforming to the following:
(a) It shall extend not less than the full width of the widest hoistway door opening.
(b) It shall have a straight vertical face, extending below the floor surface of the platform, of not less than the depth of the leveling or truck zone, plus three inches.
(c) The lower portion of the guard (three inches) shall be bent back at an angle of not less than 60° nor more than 75° from the horizontal.

17.14: continued

(d) The guard plate shall be securely braced and fastened in place to withstand a constant force of not less than 150 lbs. applied at right angles to and at any position on its face without deflecting more than ¼", and without permanent deformation.

Where the car entrance on the truck loading side is provided with a collapsible type gate and the height of the hoistway door opening is greater than the distance from the car floor to the car top, a head guard extending the full width of the door opening shall be provided on the car to close the space between the car top and the soffit of the hoistway door opening when the car platform is level with the floor at the truck loading landing entrance.

17.15: Capacity and Loading

(1) Contract Load of Passenger Elevators.

(a) For passenger elevators having platform areas not exceeding 50 square feet the contract load shall be not less than determined by the following formula:

$L = .667A^2 + 66.7A$

(b) For platform areas exceeding 50 square feet, the contract load shall be not less than: $L = .0467A^2 + 125A -- 1367$ where L = contract load in pounds and A = net inside area of car in square feet.

(c) Table below shows the maximum net inside car areas for various contract loads:

TABLE 1.

Duty Load	Net Car Area	Duty Load	Net Car Area
500	7.00	4500	46.2
600	8.3	5000	50
700	9.6	6000	57.7
1000	13.25	7000	65.3
1200	15.6	8000	72.9
1500	18.9	9000	80.5
1800	22.1	10000	88.0
2000	24.2	12000	103.0
2500	29.1	15000	125.1
3000	33.7	18000	146.9
3500	38.0	20000	161.2
4000	42.2	25000	196.5

(2) Capacity Plate and Signs for Passenger and Freight Elevators.

(a) In each passenger elevator car, a metal plate shall be provided which shall be fastened in a conspicuous place and shall bear the following information in not less than one-quarter inch letters or figures stamped in, etched, or raised on the surface of the plate:

CAPACITY (X) POUNDS SPEED (Y) FEET PER MINUTE. The contract speed of the elevator in feet per minute shall be inserted in space (Y) above.

The contract load of the elevator in pounds shall be inserted in space (X) above.

(b) In each freight elevator car, the capacity shall be indicated in a conspicuous place in letters and figures not less than one inch high, by the word "CAPACITY", followed by figures giving the contract load in pounds.

(c) Upon the crosshead of each power elevator car, a metal plate shall be placed, bearing the following information:

The weight of the complete car, including the safeties;

The contract car speed in feet per minute at which the elevator is designed to travel;

The number, diameter in inches, and the rated ultimate strength in pounds of wire ropes.

(d) In every freight elevator a sign shall be posted with one of the following markings:

1. THIS ELEVATOR DESIGNED FOR GENERAL FREIGHT LOADING.
2. THIS ELEVATOR DESIGNED FOR MOTOR VEHICLE LOADING.
3. THIS ELEVATOR DESIGNED FOR INDUSTRIAL TRUCK LOADING.

17.15: continued

Sign plates shall be of metal and letters shall be not less than ½" and stamped in, etched, or raised on the surface of the plate.

(3) Minimum Load for Freight Elevators.

(a) Minimum Load Permitted.

The minimum load for freight elevators in pounds shall be based on the weight and class of the load to be handled, but shall in no case be less than the minimum specified in 524 CMR 17.15(3)(b) for each class of loading based on the inside net platform area.

(b) Classes of Loading.

Freight elevators shall be designed for one of the following classes of loading:

1. Class A -- General Freight Loading.

Where the load is distributed, the weight of any single piece of freight or of any single hand truck and its load is not more than ¼ the rated load of the elevator, and the load is handled on and off the car platform manually or by means of hand trucks.

For this class of loading, the rated load shall be based on not less than 50 lbs. per square foot of inside net platform area.

2. Class B -- Motor Vehicle Loading.

Where the elevator is used solely to carry automobile trucks or passenger automobiles up to the rated capacity of the elevator.

For this class of loading, the rated load shall be based on not less than 30 lbs. per square foot of inside net platform area.

3. Class C. -- There are three types of Class C loading, as follows:

Class C1 -- Industrial Truck Loading where truck is carried by the elevator.

Class C2 -- Industrial Truck Loading where truck is not carried by the elevator but used only for loading and unloading.

Class C3 -- Other loading with Heavy Concentrations where truck is not used.

These loadings apply where the weight of the concentrated load including an industrial power or hand truck, if used, is more than ¼ the rated load and where the load to be carried does not exceed the rated load.

The following requirements shall apply to Class C1, Class C2 and Class C3 loadings:

The rated load of the elevator shall not be less than the load (including any truck) to be carried, and shall in no case be less than load based on 50 lbs. per square foot of inside net platform area.

The elevator shall be provided with a two-way automatic leveling device (see definition).

For Class C1 and Class C2 loadings, the following additional requirements shall apply:

For elevators with rated loads of 20,000 lbs. or less, the car platform shall be designed for a loaded truck of weight equal to the rated load or for the actual weight of the loaded truck to be used, whichever is greater. For elevators with rated loads exceeding 20,000 lbs., the car platform shall be designed for a loaded truck weighing 20,000 lbs., or for the actual weight of the loaded truck to be used, whichever is greater.

For Class C2 loading, the maximum load on the car platform during loading or unloading shall not exceed 150% of the rated load.

For any load in excess of rated load on elevators with a rated load of 20,000 lbs. or less, the driving machine motor, brake and traction relation shall be adequate to sustain and level the full 150% of rated load.

For any load in excess of the rated load on elevators with a rated load exceeding 20,000 lbs., the driving machine motor, brake and traction relation shall be adequate to sustain and level the rated load plus either 10,000 lbs. or the weight of the unloaded truck to be used, whichever is greater.

(4) Employees and Emergency Loading of Freight Elevators.

(a) Freight elevators may be used only by those persons required for handling freight.

(b) It shall be allowable at stated hours to carry employees, but not the general public, on a freight elevator, provided that the freight elevator conforms to the load-carrying requirements for passenger elevators (524 CMR 17.15) and a special permit is granted by the enforcing authority subject to the following:

17.15: continued

Car-switch operated elevators and continuous-pressure operated elevators shall be in charge of a licensed operator when used to carry employees at stated hours.

Stated hours shall be determined by the enforcing authority.

(c) It shall be allowable to carry passengers on a freight elevator under emergency conditions, equal in number to the contract load divided by 150.

(5) Safe Lift Devices.

(a) When power freight elevators are used for carrying safes or other one-piece loads greater than the contract load of the elevator, and when power passenger elevators are used for carrying concentrated loads greater than 75% of the contract load of the elevator, the requirements of 524 CMR 17.15(5)(b) through 17.15(5)(i) shall be complied with as follows:

(b) A locking device shall be provided which will hold the car at any landing independently of the hoisting ropes while the safe or other object is being loaded or unloaded.

(c) The locking device shall be so designed that it cannot be unlocked unless the entire weight of the car and load is suspended on the ropes.

(d) The wrench or other device for operating the locking device shall be removable.

(e) The locking device shall be designed to withdraw the bars should it come in contact with the landing locks if the car is operated on the up motion.

(f) A metal plate shall be provided in the elevator car which shall bear the words "Capacity Lifting Safes" in letters followed by figures giving the capacity in pounds for lifting safes for which the machine is designated, the letters and figures to be no less than one-quarter inch high, stamped, etched, or raised on the surface of the plate.

(g) The car platform, car frame, sheaves, shafts, ropes and locking devices shall be designed for the specified "Capacity Lifting Safes" with a factor or safety of not less than five.

(h) The car safeties shall be designed to stop and hold the specified "Capacity Lifting Safes" with the ropes intact.

(i) Where there is a passageway under the hoistway, the machine shall be designed to operate with the "Capacity Lifting Safes" at slow speed and the car safety shall be designed to stop and hold the car and "Capacity Lifting Safes" independently of the ropes.

(6) Operating Switch Location. All elevator machines equipped for carrying safes or other one-piece loads greater than the contract load of the elevator shall be provided with a special car switch near the machine for operating under such conditions.

17.16: Car and Counterweight Safeties and Speed Governors

(1) Power elevators suspended by ropes shall be provided with car safeties installed in or on a safety plank located beneath the car platform. Where multiple-type safeties are installed, one such safety shall be located in or on the safety plank located beneath the car platform. The safety or safeties shall be capable of stopping and sustaining the car with contract load.

(a) The application of the safety shall not cause the car platform to become out of level in excess of ½" per foot, measured in any direction.

(b) When the car safety is applied, no decrease in the tension of the governor rope or motion of the car in the descending direction shall release the car safety.

(c) It is permissible to release the safety by reversing the direction of the motion of the machine.

(d) Car safeties shall be operated by speed governors.

(e) Jaws and other parts of safeties of the sliding type, if made of forged steel of an ultimate strength of not less than 55,000 lbs. per sq. in. and cast steel of an ultimate strength of not less than 65,000 lbs. per sq. in., may, in action, be stressed to 17,000 lbs. per sq. in. For steels of greater strength the allowable stresses may be increased proportionately based on ultimate strength.

Cast iron shall not be used in any part of a car safety, the breakage or failure of which would result in failure of the safety device to function, to stop the car and sustain the load.

(f) Bearings for safety drums and screw-shafts shall be of non-ferrous material.

17.16: continued

(g) Where two (duplex) safeties are provided, the lower safety device shall be capable of developing not less than ½ of the force required to stop the entire car with rated load. Duplexed safety devices shall be arranged so as to function approximately simultaneously.

Types A or Type C safety devices (see 524 CMR 17.16(19)) shall not be used in multiple (duplexed).

(h) Type B safeties shall stop the car with its rated load from governor tripping speed within the range of the stopping distances shown by Table 2 in 524 CMR 17.16.

TABLE 1.

MAXIMUM AND MINIMUM STOPPING DISTANCES
TYPE B CAR SAFETIES WITH RATED LOAD, AND OF TYPE B
COUNTERWEIGHT SAFETIES

Rated Speed in Per Minute	Maximum Governor Trip Speed in Feet Per Minute	Stopping Distances in Feet-Inches Feet Minimum	Maximum
0 to 125	175	0-6	1-3
150	210	0-6	1-4
175	250	0-8	1-7
200	280	0-9	1-10
225	308	0-10	2-0
250	337	0-11	2-3
300	395	1-1	2-9
350	452	1-3	3-4
400	510	1-6	4-0
450	568	1-9	4-10
500	625	2-1	5-8
600	740	2-9	7-7
700	855	3-7	9-10
800	970	4-6	12-6
900	1085	5-5	15-3
1000	1200	6-8	18-6
1100	1320	7-11	22-4
1200	1440	9-4	26-4
1300	1560	10-11	30-11
1400	1680	12-7	35-7
1500	1800	14-5	40-10

(i) Counterweight safeties where furnished shall conform to the requirements for car safeties except where otherwise specified.

Exceptions:

1. Where otherwise specified in 524 CMR 17.16(3).
2. For rated speeds of not over 125 feet per minute counterweight safeties may be operated as the result of breaking or slackening of the hoisting ropes and may be of the inertia or other approved type without governors. (See 524 CMR 17.16(3)).

(j) Safeties shall be so designed that on their application the forces which provide the stopping action shall be compressive forces on each side of the guide-rail section.

(2) Speed governors for car safeties shall be set to trip at over speeds as follows:

(a) At not less than 115% of rated speed.

(b) At not more than the tripping speed listed opposite the applicable rated speed in Table 2 in 524 CMR 17.16.

TABLE 2.

MAXIMUM SPEEDS AT WHICH SPEED GOVERNOR TRIPS AND GOVERNOR OVERSPEED SWITCH OPERATES

Rated Speed in Feet Per Minute	Maximum Governor Trip Speed in Feet Per Minute	Maximum Speed at Which Governor Overspeed Switch Operates, Down Feet Per Minute
0 to125	175	175*
150	210	210*
175	250	225
200	280	252
225	308	277
250	337	303
300	395	355
350	452	407
400	510	459
450	568	512
500	625	563
600	740	703
700	855	812
800	970	921
900	1085	1031
1000	1200	1140
1100	1320	1254
1200	1440	1368
1300	1560	1482
1400	1680	1596
1500	1800	1710

* Governor Overspeed Switch Not Required

(3) The counterweight safety, where required, shall be operated by a separate speed governor. Provision shall be made to cause the application of the counterweight safety at a speed greater than that at which the car safety is applied, but not more than 10% above that speed. Broken rope safeties of the instantaneous type may be used on counterweights within the limits of the following:

TABLE 3.

Contract Speed	Total Weight of Counterweight
250 fpm	2000 lbs
200 fpm	3000 lbs
160 fpm	4000 lbs
125 fpm	5000 lbs

Exception: Speed governors are not required for the operation of counterweight safeties having a rated speed of not more than 125 feet per minute.

Every car safety shall be provided with a switch operated by the car safety mechanism. This switch shall conform to the requirements of 524 CMR 17.16(10).

(4) Car safeties shall be either of the instantaneous type or shall be of the sliding type which will bring the car to a stop or within the limits of the retardation hereinafter specified. Instantaneous type car safeties shall not be used for contract speeds exceeding 125 F.P.M.

17.16: continued

(5) The distance between the safety jaws shall not be less than the thickness of the guide rail plus 3/32" and the jaws shall not drag against the rail. Where roller or other types of guide shoes are used arranged with springs or other means which provide for a definite and limited movement of the car or counterweight with respect to the guide rails, minimum clearance specified shall be increased by an amount sufficient to prevent the safety jaws from coming in contact with the guide rails should the maximum car movement permitted by the guide shoes occur.

(6) Safeties shall be marked by the manufacturer with the range of weight and speed for which they are designed; said weight to include the complete car structure, the safety, the contract load in the car, and all moving equipment the weight of which is borne by the safety.

(7) Overspeed instantaneous safeties shall be applied by the governor. On the parting of the hoisting ropes governor applied instantaneous safeties shall apply instantly and independently of the speed action of the governor.

(8) No safety shall be permitted for stopping an ascending car or counterweights.

(9) The governor shall be located where it cannot be struck by the car in case of overtravel and where there is sufficient space for full movement of governor parts. Sufficient space as it pertains to 524 CMR 17.16 shall mean not less than eight inches.

(10) A switch shall be provided on the speed governor and operated by the overspeed action of the governor when used with Type B and C car safeties of elevators having a rated speed exceeding 125 feet per minute, and when used with counterweight safeties.

Every car safety shall be provided with a switch operated by the car safety mechanism when the safety is applied.

These switches shall, when operated, remove power from the driving-machine motor and brake before or at the time of application of the safety.

(a) The setting of the car speed-governor overspeed switch shall conform to the following:

1. For rated speeds more than 125 feet per minute, up to and including 500 feet per minute, the car speed-governor overspeed switch shall open in the down direction of the elevator at not more than 90% of the speed at which the governor is set to trip in the down direction.

2. For rated speeds more than 500 feet per minute, the car speed-governor overspeed switch shall open in the down direction of the elevator at not more than 95% of the speed at which the governor is set to trip in the down direction.

3. The switch, when set as specified in either 524 CMR 17.16(10)(a)1. or 17.16(10)(a)2., shall open in the up direction at not more than 100% of the speed at which the governor is set to trip in the down direction.

Exception: The speed-governor overspeed switch may be set to open in the down direction of the elevator at not more than 100% of the speed at which the governor is set to trip in the down direction, subject to the following requirements:

A speed-reducing switch of the manually reset type is provided on the governor which will reduce the speed of the elevator in case of overspeed, and which shall be set to open as specified in 524 CMR 17.16(10)(a)1. and 17.16(10)(a)2.

Subsequent to the first stop of the car following the opening of the speed-reducing switch, the car shall remain inoperative until the switch is manually reset.

(b) Switches used to perform the functions specified shall be positively opened. Overspeed and speed-reducing switches, permitted by the exception to 524 CMR 17.16(10)(a), operated by the speed governor shall remain in the open position until manually reset. Switches operated by the car safety mechanism shall be of a type which will not reset unless the car safety mechanism has been returned to the off position.

(11) The size, material, and construction of the governor rope, together with the rated tripping speed of the governor, shall be stamped on the governor stand or given on a brass plate attached to it in letters not less than ¼" in height.

17.16: continued

(12) The arc of contact between the governor rope and the driving sheave shall, in conjunction with a tension device, provide sufficient traction to cause proper operation of the governor.

(a) The minimum length of governor jaws shall be such that no serious cutting, tearing, or deformation of the rope shall result from the operation of the safety.

(b) Governor jaws for sliding type safeties shall be so designed that the rope will pull through these jaws on the application of a stress exceeding that required to operate so as to stop the car.

(13) Elevators having winding-drum machines shall be provided with a slack-rope device which will cut off the power and stop the elevator machine if the car is obstructed in its descent. Slack-rope switches shall be so constructed that they will not automatically reset when the slack in the rope is removed.

(14) No car safety which depends on the completion or maintenance of an electric circuit for the application of the safety shall be used. Car safeties shall be applied mechanically.

(15) The gripping surfaces of the car or counterweight safeties shall not be used to guide the car or counterweights.

(16) A pawl or ratchet or chisel point safety shall not be used.

(17) Speed governors shall have their means of speed adjustment sealed after test. If speed governors are painted after sealing, all bearing and rubbing surfaces shall be kept free or freed of paint and a hand test made to determine that all parts operate freely as intended. Seals shall be of a type which will prevent readjustment of the governor tripping speed without breaking the seal.

(18) Each governor shall be sealed directly after testing by the authorized inspector conducting the test. No person other than an authorized inspector shall tamper with, break, or remove the seal.

(19) The governor-rope releasing carrier on the car (or on the counterweight) shall be set to require a tension in the governor rope, to pull the rope from the carrier, of not more than 60% of the pull-through tension developed by the governor; and the carrier shall be designed so that the pull-out tension cannot be adjusted in a normal manner to exceed the amount specified.

(20) Car safety devices (safeties) are identified and classified on the basis of performance characteristics after the safety begins to apply pressure on the guide rails. On this basis, there are three types of safeties:

(a) Type A Safeties. Safeties which develop a rapidly increasing pressure on the guide rails during the stopping interval, the stopping distance being very short due to the inherent design of the safety. The operating force is derived entirely from the mass and the motion of the car or the counterweight being stopped. These safeties apply pressure on the guide rails through eccentrics, rollers or similar devices, without any flexible medium purposely introduced to limit the retarding force and increase the stopping distance.

(b) Type B Safeties. Safeties which apply limited pressure on the guide rails during the stopping interval, and which provide stopping distances that are related to the mass being stopped and the speed at which application of the safety is initiated. Retarding forces are reasonably uniform after the safety is fully applied. Continuous tension in the governor rope may or may not be required to operate the safety during the entire stopping interval. Minimum and maximum distances are specified on the basis of governor tripping speed (see 524 CMR 17.16(1)(h)).

17.16: continued

(c) Type C Safeties. (Type A with Oil Buffers). Safeties which develop retarding forces during the compression stroke of one or more oil buffers interposed between the lower members of the car frame and a governor-operated type A auxiliary safety plank applied on the guide rails. The stopping distance is equal to the effective stroke of the buffers.

(21) Type C safeties may be used subject to the following requirements:
(a) The rated speed shall be not more than 500 feet per minute.
(b) The oil buffers shall conform to all requirements specified in 524 CMR 17.31 for oil buffers, except that the stroke shall be based on governor tripping speed and on an average retardation not exceeding 32.2 feet per second.
(c) After the buffer stroke, as defined in 524 CMR 17.16(21)(b) has been completed, provision shall be made for an additional travel of the plunger or piston of not less than 10% of the buffer stroke to prevent excessive impact on the buffer parts and the auxiliary safety plank.
(d) Where the distance between guide rails exceeds eight feet, the safety shall be provided with two oil buffers of substantially identical calibration; and the buffers shall be so located as to develop minimum stresses in the auxiliary safety plank during safety operation.

Buffers shall be located in line with and symmetrically between the guide rails.
(e) The auxiliary safety plank shall be so supported and guided below the car frame that the clearances specified in 524 CMR 17.16(5) for the safety parts are maintained during normal operation.

The auxiliary safety plank shall be so designed that the maximum stresses in the plank shall not exceed those specified for similar car-frame members in 524 CMR 17.13.
(f) The rail-gripping device of the auxiliary safety plank shall be so arranged and connected as to prevent the plank from being out of level more than ½" in the length of the plank when the safety is operated to stop the car.
(g) An electric switch shall be provided and so arranged and connected that the elevator cannot be operated by means of the normal operating device if any buffer is compressed more than 10% of its stroke.
(h) Means shall be provided to prevent operation of the elevator by means of the normal operating device if the oil level in any buffer is below the minimum allowable level.

(22) For all type B safeties the movement of the governor rope, relative to the car or the counterweight respectively, required to operate the safety mechanism from its fully retracted position to a position where the safety jaws begin to exert pressure against the guide rails, shall not exceed the following values based on rated speed:
(a) For Car Safeties:
200 feet per minute or less -- 42"
201 to 375 feet per minute -- 36"
Over 375 feet per minute -- 30"
(b) For Counterweight Safeties:
All speeds -- 42".

Drum-operated car and counterweight safeties, requiring continual unwinding of the safety drum rope to fully apply the safety, shall be so designated that not less than three turns of the safety rope will remain on the drum after the overspeed test of the safety has been made with rated load in the car.

(23) Speed Governor Data Plate. A metal plate shall be securely fastened to all speed governors and shall include the following information in legible, permanent figures and letters ¼" in height:
(a) The speed in feet per minute at which the governor is set and sealed to trip the governor rope grip jaws.
(b) The size, material, and construction of the governor rope on which the governor jaws were designed to operate.

The maximum contract speeds of elevators shall be as follows:

Type of control: Variable voltage or unit multi-voltage shall not exceed 1500 feet per minute.

17.17: Car Speeds

Direct current rheostatic shall not exceed 600 feet per minute.

Hydraulic shall not exceed 500 feet per minute.

Alternating current 200 feet per minute.

Continuous pressure 150 feet per minute.

Electro-hydraulic 200 feet per minute.

17.18: Illumination of Cars and Lighting Fixtures

(1) Lights and Illumination Required. Cars shall be provided with an electric light or lights; not less than two lamps shall be provided. The minimum illumination at the landing edge of the car platform when the car and landing doors are open shall be not less than the following:
(a) For passenger elevators, five foot candles.
(b) For freight elevators, 2½ foot candles.
(c) Adequate car top lighting will be installed with a guarded bulb.

(2) Light Control Switches. Light control switches are not required, but if provided they shall:
(a) Be located in or adjacent to the operating device in the car.
(b) In elevators having automatic operation, be of the key operated type or located in a fixture with a locked cover.

(3) Passenger Car Lighting Devices. Suspended glass used for lighting fixtures shall be supported by a metal frame secured at not less than three points. Fastening devices shall not be removable from the fixture. Glass shall not be drilled for attachment. Light troughs supporting wire raceways and other auxiliary lighting equipment where used shall be of metal, except where lined with non-combustible materials.
NOTE: Lighting arrangements using slow-burning combustible materials for diffusing and illumination purposes shall be permitted provided such combustible materials do not come in contact with lighting equipment.

(4) Guarding of Light Bulbs or Tubes in Passenger Cars. Light bulbs or tubes in passengers cars shall be so guarded as to prevent injury to passengers from breakage of the bulbs or tubes.

(5) Lamp Guards for Freight Cars. Lamps shall be equipped with substantial guards to prevent breakage.

(6) Glass in Car Lighting Fixtures. Glass used in connection with car lighting fixtures shall conform with 524 CMR 17.13(6). Glass exceeding one square foot in area shall be laminated type. The total area of glass in enclosure and doors shall not exceed four square feet.

(7) Emergency Lighting. All elevators shall be provided with emergency electric lighting conforming to the following:
(a) The emergency system shall provide some general illumination for the car. The intensity of illumination four feet above the car floor and approximately one foot in front of a car station shall be not less than 2/10 of a foot candle. Lights shall be automatically turned on in all elevators in service not more than ten seconds after normal lighting power fails. The power system shall be capable of maintaining the above light intensity for a period of four hours.
(b) Not less than two lamps approximately of equal wattage shall be used.
(c) The emergency lighting system shall be kept in workable condition so that it will perform the functions for which it is intended.

17.18: continued

(d) Elevators which are located in buildings other than private residences and which are operated at any time without a designated operator in the car shall be provided with one of the following emergency signal systems.

(e) If the bell and/or the means of two-way conversation are normally connected to the building power supply, they shall automatically transfer to a source of emergency power within ten seconds after the normal supply fails. The power shall be capable of providing for the operation of the bell for one hour and the means of two-way conversation for four hours.

17.19: Contract-Load Test

(1) A contract load test under the supervision of the authorized inspector shall be made of every new power elevator before the elevator is placed in regular service. This test shall be made with contact load in the car. The brakes, limit switches, buffers, car safety, and speed governor shall be caused to function in each test, and approval of any elevator shall be granted only upon satisfactory completion of such test.

(2) Car and counterweight safeties and governors shall be tested as follows:

(a) Governor operated instantaneous type safeties or sliding type safeties of alternating current elevators shall be tested at rated speed by tripping the governor by hand. In such cases, the governor shall be separately tested for tripping speed.

(b) Sliding type safeties of elevators other than alternating current type shall be tested at governor tripping speed with the wire ropes attached and all electrical apparatus operative except for the overspeed control switch on the governor, if any.

(c) On overspeed tests, the stopping distance of sliding type safeties shall be determined by measuring the marks made on the guide rails by the safety jaws and with rated load in the car shall not be less than shown by curve 1, Figure 1 in 524 CMR 17.16, or greater than curve 2, Figure 1 in 524 CMR 17.16.

17.20: Equipment Prohibited Inside Car

Apparatus or equipment other than that used in connection with the operation of the elevator shall not be installed inside any elevator car.

EXCEPTIONS:

(a) Railroad and conveyor tracks in freight elevators.

(b) Light, heating, ventilation and air conditioning equipment.

(17.21: Reserved)

17.22: Machines and Machinery

(1) Drums and leading sheaves shall be of cast iron or steel, and shall have finished grooves. U-grooves shall be not more than one-sixteenth inch larger than the ropes. The pitch diameter of sheaves or drums for hoisting or counterweight ropes shall be not less than 40 times the nominal diameter of the rope. Opening in drums shall be drilled at an angle of not over 45° with the run of the rope and shall be provided with a rounded corner with a radius at least equal to that of the rope.

(2) The factor of safety based on the static load to be used in the design of elevator hoisting machines shall be not less than ten for cast iron, cast steel, or materials other than wrought iron or wrought steel. For wrought iron or wrought steel, the factor of safety shall be eight.

(3) No set-screw fastenings shall be used in lieu of keys or pins if the connection is subject to torque or tension. Shafts which support drums, gears, couplings and other members and which transmit torque shall be provided with tight fitting keys. A fillet shall be provided at any point of change in the diameter of driving-machine sheave shafts, or drums to prevent excessive stress concentrations in the shafts.

17.22: continued

(4) No friction gearing or clutch mechanism shall be used for connecting the drums or sheaves to the main driving gear of power elevators.

(5) No belt or chain-driven machine shall be used to drive any power elevator.

(6) No worm gearing having cast iron teeth shall be used for any power elevator machine.

(7) Electric elevator machines shall be equipped with electrically released brakes which are applied by compression springs. No brakes shall be released until power has been applied to the motor.

(8) No single-ground, short-circuit, or counter-voltage shall prevent the action of the brake magnet from allowing the brake to set in the intended manner during normal operation. No motorfield discharge, counter-voltage, single ground, or accidental short-circuit shall retard the action of the brake magnet in allowing the brake to set during emergency stops.

(9) Welding. Welding of parts on which safe operation depends shall be done in accordance with the appropriate standards established by the American Welding Society. All welding of such parts shall be done by welders qualified in accordance with the requirements of the American Welding Society. At the option of the manufacturer, the welders may be qualified by one of the following:
 (a) By the manufacturer.
 (b) By a professional engineer.
 (c) By a recognized testing laboratory.

(10) Numbering of Elevators. When machinery of more than one elevator is in a machine room, each elevator machine shall be assigned a different number which shall be painted on or securely attached to the driving machine. The corresponding disconnect switch shall carry the same number.

17.23: Hydraulic Elevator Machines, Tanks, Pumps, Valves, and Gauges

(1) Types of Driving Machines. Types of driving machines shall be of the direct plunger type.

(2) Machine and sheave beam supports and their foundations overhead beams and overhead sheaves and their supports for counterweights where provided shall conform to 524 CMR 17.02(12) through 17.02(17).

(3) Vertical Bottom Clearance. Vertical bottom clearance shall comply to 524 CMR 17.04(2).

(4) Gas Releases. Cylinders of hydraulic-elevator machines shall be provided with means for releasing air or other gas.

(5) Tanks, Pipes and Fittings.
 (a) The outlet of pressure tanks shall be so located near the bottom to prevent the entrance of air or other gas into the elevator piping and cylinder under any condition of service.
 (b) Pressure tanks that may be subjected to vacuum shall be provided with one or more vacuum relief valves to prevent the collapse of the tanks.
 (c) Pressure tanks shall be so located and supported that inspection may be made of the entire exterior.
 (d) Discharge tanks shall be covered to prevent the entrance of foreign material and provided with a suitable vent to the atmosphere.

17.23: continued

(e) Pressure tanks, pipes and fittings shall be made and tested in accordance with the best practice. In case any question arises as to what is the best practice, work done according to the requirements of the A.S.M.E. Unfired Pressure Vessels Code shall be considered as conforming to the best practice. Welding of all parts on which safe operation depends shall conform to the requirements of 524 CMR 17.22(9).

(f) All piping shall be so supported as to eliminate undue stresses at joints and fittings, particularly at any section of the line subject to vibration.

(g) Flexible connections shall not be installed between the check valve, or control valve, and the cylinder.

(h) Flexible connections may be installed other than between the check valve, or the control valve, and the cylinder provided the failure of the sealing element shall not permit separation of the joints connected.

(i) Flexible hose shall have a bursting strength of not less than ten times the working pressure. The replacement date of all hose shall not exceed six years and shall be permanently marked with the SAE hose type identification and the required replacement date.

(j) Atmospheric storage and discharge tanks shall conform with the following:

1. They shall be so designed and constructed that when completely filled, the factor of safety shall be not less than four, based on the ultimate strength of the material.
2. They shall be provided with a means of checking the liquid level. Such means shall be accessible without removal of any cover or other part.

(6) Relief Valve. Each pump or group of pumps shall be equipped with a relief valve conforming to the following requirements:

(a) Type and Location. The relief valve shall be located between the pump and the check valve and shall be of such a type and so installed in a by-pass connection that the valve cannot be shut off from the hydraulic system.

(b) Setting. The relief valve shall be pre-set to open at a pressure not greater than 125% of the working pressure at the pump.

(c) Size. The size of the relief valve and by-pass shall be sufficient to pass the maximum rated capacity of the pump without raising the pressure more than 20% above that at which the valve opens. Two or more relief valves may be used to obtain the required capacity.

(d) Sealing. Relief valves having exposed pressure adjustments, if used, shall have their means of adjustment sealed after being set to the correct pressure.

EXCEPTIONS: No relief valve is required for centrifugal pumps driven by induction motors, provided the shut-off, or maximum pressure which the pump can develop, is not greater than 135% of the working pressure at pump.

(e) Relief valves shall be painted a distinctive color, preferably red, and shall have a permanently marked metal plate attached to the handwheel or other opening or closing device with letters not less than ⅜" in height reading, "Relief Valve".

(f) All work including installation, adjustment, and sealing of valves after being set to correct position, and including the lowering of the car by manual operation of the valves, shall be performed only by a licensed elevator mechanic.

(7) Gages.

(a) Each pressure tank shall be provided with a gage glass, having fittings and valves of material that will not be corroded by the fluid, and equipped to automatically shut off the fluid in case of failure of the gage glass. The gage glass shall be attached directly to the tank and so located as to indicate the level of the fluid within the working limits.

(b) Each pressure tank shall have a pressure gage which correctly indicates pressure to at least 1½ times the normal working pressure allowed in the tank. This gage shall be connected to the tank by a pipe of such material that it will not be corroded by the fluid and in such a manner that the gage cannot be shut off from the tank except by a cock with a "T" or lever handle. The cock shall be located near the gage.

(c) Pressure tanks shall be provided with a ¼" pipe-size valved connection for attaching an inspector's test gage while the tank is in service.

(d) Tanks shall be provided with means to render the elevator inoperative in the up direction, if for any reason the liquid level in the tank falls below the permissible minimum.

17.23: continued

(8) Elevators Operated by Steam or Gas. Hydraulic elevators operated from a pressure tank where the fluid pressure is obtained by directly admitting steam, air or other gas to the tank shall comply with all the rules covering hydraulic elevators.

(9) Plungers and Cylinders of Hydraulic Elevators.

(a) The plunger shall be of uniform diameter and as nearly as possible of uniform thickness and finished on the outside. The pressure end of the plunger shall be provided with a plunger bottom either of greater diameter than the plunger or other means shall be provided to prevent the plunger from traveling beyond the limits of the cylinder without loss of fluid and to prevent the car striking the limits of the hoistway.

(b) Plungers of hydraulic elevators shall be of ample strength and rigidity as a column to support the loads and to withstand the compressive forces impressed upon them with a factor of safety not less than three for any position of the car in the hoistway. Walls of plungers of hydraulic elevators, subject to external pressure, shall be of sufficient thickness to insure stability of the cross-section with a factor of safety not less than three.

(c) Cylinders of hydraulic elevators shall be designed with a factor of safety of at least five against bursting.

(d) Where plungers are composed of more than one section, the strength at the joints shall be equal to or greater than the strength of the plunger.

(e) Plungers of plunger elevators shall be securely fastened to the car frame or car platform.

(f) Where plunger elevators are provided with a counterbalance and the length and weight of the plunger is such that the weight of the counterweight and counterweight ropes exceeds the weight of the elevator car, the fastening between the plunger and the car frame or platform shall be of sufficient strength to support the entire weight of the plunger. In addition, a rod or loop of galvanized wire rope shall be provided inside the plunger, attached to the bottom of the plunger and the car frame, of sufficient strength to support the weight of the plunger in case the fastening between the top of the plunger and the car should fail.

(g) Sufficient clearance shall be provided at the bottom of the cylinder of hydraulic elevators so that the bottom end of the plunger will not strike the bottom head of the cylinder when the car is resting on the fully compressed buffers or stops.

(h) A permanent type data tag shall be affixed to the tank reservoir unit in the machine room in clear sight, and shall contain the following information:

1. Date of installation
2. Name of installing company
3. Name of manufacturer
4. Piston diameter
5. Manufacturer's designed head pressure

(10) General Requirements for Plunger Elevators.

(a) Cars of plunger elevators are not required to be equipped with car safeties, provided the ram or plunger is directly connected to the structural member comprised of the steel bolster, or steel crosshead channels, where steel stile channels are an integral part of the assembly.

(b) Top clearances of plunger elevator cars and counterweights shall comply with the following for contract speeds not in excess of 100 f.p.m.:

There shall be a clear distance of not less than two feet between the top of the crosshead of the car and the corresponding point of any obstruction or equipment in the hoistway vertically above it when the plunger is in its fully extended position.

When any equipment on the car projects more than two feet above the car crosshead, the minimum overhead car clearances required shall be increased by the amount which this projection exceeds two feet.

There shall be a clear distance of not less than six inches above the top of the counterweight where provided and the corresponding point of any obstruction in the hoistway vertically above it when the plunger is in its lowest position.

(c) Plunger elevators shall have car guide rails of metal of such dimensions and strength as to withstand the thrusts to which they are subjected.

(d) In all other respects, plunger elevators shall be subject to the requirements for freight and passenger elevators.

17.23: continued

EXCEPTION: The side door on all oil hydraulic elevators may be omitted provided the discharge valve is operated only by a licensed constructor, maintenance man or repairman of elevators. A sign shall be posted in a conspicuous position near the valve and shall be securely fastened. This sign shall be of metal and shall contain the following marking:

DANGER (In letters one inch high) This valve shall be operated only by licensed elevator personnel.

(e) When liquid in excess of two gallons per month is added to the tank of a hydraulic elevator or dumbwaiter, where the driving machine is of the direct plunger type, the following rules shall be fully complied with:

1. A log shall be posted in the pump room on the liquid tank in full view of a person instructed to add liquid.
2. The log shall read as follows:
   Amount of liquid added in gallons.
   Date when liquid was added.
   Full name of person adding liquid to the hydraulic tank.

A letter shall be mailed immediately to the authorized inspector having jurisdiction and a copy of the letter mailed to the Department of Public Safety, Elevator Division, One Ashburton Place, Boston, when the given amount of liquid is added.

(11) Automatic Leveling for Hydraulic Elevators. All hydraulic elevators shall be provided with two-way automatic leveling.

(12) Anti-Creep Leveling Devices. Every hydraulic elevator shall be provided with an anti-creep leveling device conforming to the requirements of subdivision:

(a) It shall maintain the car within three inches of the landing from any point within the interlock zone irrespective of the position of the hoistway door.

(b) For the electro-hydraulic elevators, it shall be required to operate the car only in the up direction.

(c) For maintained pressure hydraulic elevators, it shall be required to operate the car in both directions.

(d) Its operation may depend on the availability of the electric power supply provided that:

1. The disconnect switch required by 524 CMR 17.34 is in the closed position at all times except during maintenance, repairs and inspections, and
2. The electrical protective devices required by 524 CMR 17.23(12) shall not cause the power to be removed from the device.

EXCEPTION: Stop switches in pits, stop switches on top of cars, and car side emergency exit door contact switches may be connected to cause the power to be removed from the anti-creep leveling device.

(13) Power Disconnecting Switch. The power disconnecting switch conforming to requirements of 524 CMR 17.34(1), 1966 Amendments shall be provided except that it shall be connected into the power supply line to control valve operating magnets, and to the pump motor in the case of electro-hydraulic elevators. Where the hydraulic pressure is supplied by a pressure tank and an electric pump, a separate disconnecting switch shall be provided to disconnect the power from the pump driving motor.

The disconnect switch shall be kept in the closed position at all times except during maintenance, repair or inspection.

17.24: Venting of Machinery Spaces

Machinery spaces of hydraulic elevators shall be provided with means for venting smoke and hot gases to the outer air in case of fire.

EXCEPTION: Machinery spaces located not more than ten feet from the hoistway may be vented to the hoistway through continuous non-combustible ducts securely fastened to and penetrating the hoistway structure.

(1) Area of Vents. The area of the vents shall be not less than 1% of the area of the machinery space and shall conform to the following:

17.24: continued

(a) Vent openings in machinery spaces shall be located directly under the roof in the machinery enclosure.
(b) The openings of ducts shall be covered with a wire enclosure which shall have not greater than ⅜" mesh.

17.25: Venting of Elevator Hoistways

(1) The closed ventilation means may be opened by any of the following generally accepted methods, which may be established as adequate by competent agencies:
(a) by an approved automatic thermostat
(b) by a tested fusible link
(c) by a combination heat and smoke detector
The above methods shall be open at a temperature of not less than 160°F.
The above methods shall be designed to open at a temperature of not less than 160°F.

17.26: Hoisting Ropes

(1) Power elevators shall be provided with iron or steel wire hoist and counterweight ropes.
EXCEPTION: Where capacity is in excess of 300 lbs., the rope hitch shall be babbitted sockets.

(2) No covering shall be permitted on ropes other than where liability to excessive corrosion or other hazard exists, in which case marline covering may be used.

(3) The factor of safety based on static loads for car and counterweight ropes for power passenger and freight elevators shall be not less than the values given in Figures 1 and 2 in 524 CMR 17.26, corresponding to the contract speed of the car.

17.26: continued

FIGURE 1.

Factors of Safety for Hoisting and Counterweight Ropes for Power Passenger Elevators

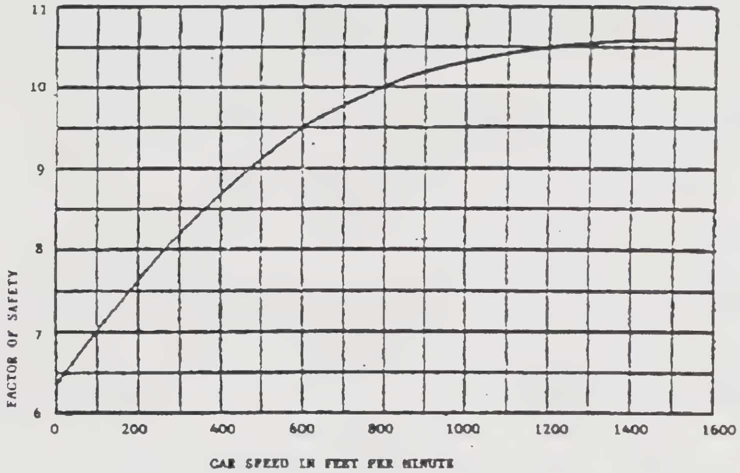
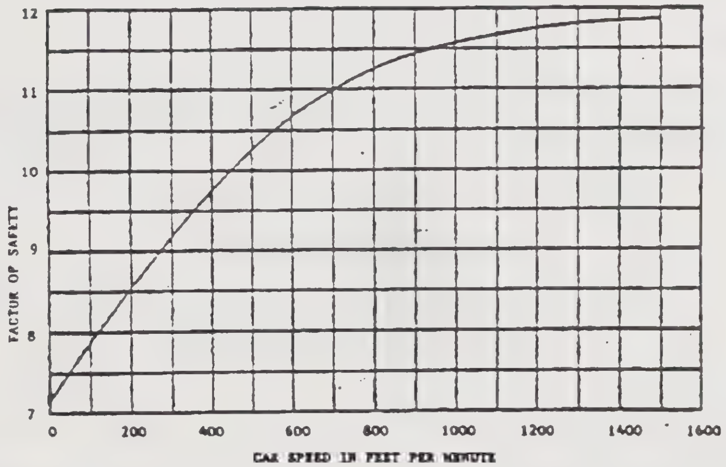


FIGURE 2.

Factors of Safety for Hoisting and Counterweight Ropes for Power Freight Elevators



(4) Hoisting ropes shall be not less than ½" in diameter.

(5) The minimum number of hoisting ropes shall be determined by using the factor of safety found in Figures 1 and 2 in 524 CMR 17.26 together with the rated ultimate strength of the wire rope. The computed load on the car hoisting ropes shall be of the weight of the elevator car plus the contract load, plus the weight of the car-hoisting rope and the compensation minus the weight of the independent car counterweight, if any.

(6) The minimum number of hoisting ropes used with traction elevators shall be three. If any wire hoist rope of a set is worn or damaged and requires replacement, the entire set of ropes shall be replaced.

(7) The minimum number of ropes used with winding-drum elevators shall be two car-hoisting ropes and two ropes for each counterweight used.

17.26: continued

(8) Where winding-drum machines are used, the required crosshead capacity plate shall bear the following information:

FIGURE 3.

WIRE ROPE SPECIFICATIONS

Rope	Number	Diameter in inches	Rated Ultimate Strength in lbs.
Hoisting			
Car Counterweight			
Machine Counterweight			

(a) Where traction machines are used, the crosshead capacity plate shall bear the following information:

FIGURE 4.

WIRE ROPE SPECIFICATIONS

Rope	Number	Diameter in inches	Rated Ultimate Strength in lbs.
Hoisting Ropes			

(b) Where hydraulic machines are used, the crosshead capacity plate shall bear the following information:

FIGURE 5.

WIRE ROPE SPECIFICATIONS

Rope	Number	Diameter in inches	Rated Ultimate Strength in lbs.
Hoisting			
Car Counterweight			

(9) A metal tag shall be attached to the rope fastenings. On this tag shall be stated the following:

(a) Diameter.
(b) Rated ultimate strength.
(c) Material of the ropes.
(d) Date of the rope installation.
(e) Name of company or person installing ropes.
(f) Name of manufacturer.
(g) Whether non-preformed or preformed.
A tag shall be reinstalled at each rope renewal.

17.26: continued

(10) Where wire rope equalizers are used, the equalizers and their fastenings in their several parts and assembly shall have a strength of not less than 10% in excess of the required strength of the rope. Rope equalizers, when used, other than those of the single swing tree type used with drum type machines and those of the individual compression spring type capable of being fully compressed without failure, shall be approved on the basis of tests, made by a competent designated laboratory, showing the ultimate strength of the equalizer and its fastenings in its several parts and assembly.

(11) All wire ropes anchored to a winding drum shall have not less than one turn of rope on the winding drum when the car or counterweight has reached the extreme limit of its over-travel.

(12) No car or counterweight rope shall be lengthened or repaired by splicing.

(13) The winding-drum ends of car or counterweight ropes shall be secured by clamps on the inside of the drums or by individual tapered babbitted sockets.

(14) The car and counterweight rope ends shall be fastened by individual babbitted sockets or wedge type clamp.

(15) Where socketed rope fastenings are used, adjustable shackle rods shall be provided to attach wire ropes to cars and counterweights in such a manner that all portions of the rope other than the portion within the socket shall be readily visible.

((16) Reserved)

((17) Reserved)

(18) Method of Socketing Wire Ropes.
(a) Where a babbitted socket is used, the length of the socket shall be not less than 4.75 times the nominal diameter of the rope.
(b) The hole at the small end shall be as given in the following table:

TABLE 1.

RELATION OF WIRE ROPE TO SMALL DIAMETER OF WIRE ROPE SOCKET

Nominal Diameter or # Rope in in.	Inside Diameter of Small End of Rope Socket
¼ to 7/16 inclusive	shall not be more than 1/16 in. larger than actual rope diameter
½ to ¾ inclusive	shall not be more than 3/32 in. larger than actual rope diameter
⅞ to 1⅛ inclusive	shall not be more than ⅛ in. larger than actual rope diameter
1¼ to 1½ inclusive	shall not be more than 3/16 in. larger than actual rope diameter

(c) The hole opening at the small end of the socket shall be rounded and free from cutting edges.
(d) The hole opening at the large end of the socket shall be not less than 2.25 times the nominal diameter of the rope.
(e) The socket shall be drop-forged steel, or steel casting.
(f) The socket shall be of such strength that the rope will break before the socket is perceptibly deformed.
(g) Rope ends to be socketed shall be served with three seizings at each side of any point at which the rope is to be cut.

17.26: continued

(h) Only annealed iron wire shall be used as a seizing wire. The wires shall be wound tight and even. The twisted ends of the seizing shall be so placed that they fall into the valleys between strands and away from the ends of the rope, as otherwise the seizing will not pass through the small hole end of the socket.
(i) For ⅝ inch or smaller wire rope, the first two seizings shall be not less than ½" long, and the third seizing not less than ¾" long. The first seizing shall be close to the cut, and the second seizing shall be spaced back from the first seizing the length of the end to be turned in. The third seizing shall be at a distance from the second seizing equal to the length of the socket. Larger rope requires longer seizing than specified above.
(j) Tape shall not be used for seizing.
(k) The rope thus served shall be entered at the small hole and slipped through the socket a sufficient distance for manipulating, and after removing the first two seizings the strands shall be spread and the hemp center cut out as close as possible to the remaining seizing and removed. All grease shall be carefully removed by wiping off the extended strands and washing with a non-flammable solvent. The strand ends shall then be bent and turned in and bunched closely together. The portion turned in shall have a length not less than 2½ times the nominal diameter of the rope. Then, with the rope end pulled as far as possible into the socket, the turned ends or loops in the strand of all socketed ropes shall be turned towards the center of the socket and shall project above the babbitted end not more than ¼" and not less than ⅛". The third seizing shall slightly project outside the hole at the small end of the socket. The socket, when ready for pouring, shall be held vertical and the rope held truly axial with the socket. Tape or waste may be wound around the rope at the small end of the socket to prevent the metal from seeping through but shall be removed after the metal has cooled.
(l) Only clean babbitt metal free from dross shall be used heated to a fluidity just sufficient to char a piece of soft wood without igniting it.
(m) Where the seizing and socketing has been done properly, the original and uniform relation of rope lay will not be disturbed. Any disturbance of rope lay is a clear indication of careless seizing and socketing and is not permitted.
(n) Whenever elevator ropes are replaced or shortened, the counterweight top clearances shall not be reduced below those required.
(o) Auxiliary rope-fastening devices, designed to support elevator cars or counterweights if any regular rope-fastening fails, may be provided subject to the following requirements:

1. They shall be approved by the enforcing authority on the basis of adequate tensile and fatigue tests made by a competent designated laboratory.
2. The device and its fastenings, in its several parts and assembly, shall have a strength at least equal to that of the manufacturer's breaking strength of the rope to which it is to be attached.
3. Steel parts used in the device shall be cast or forged with an elongation of not less than 20%, conforming to ASTM specifications A235-63T, Class C for forgings and A27-62, grade 60/30 for cast steel, and shall be stress relieved.
4. The device shall be so designed and installed that:

It will not become operative unless there is a failure of the normal rope fastening.
It will function in a rope movement of not over 1½".
It will not interfere with the vertical or rotational movements of the rope during normal service.

(19) Periodic Resocketing of Babbitted Rope Sockets of Car Hoisting Ropes on Winding-Drum Driving Machines.

(a) Refastening Periods. The hoisting ropes of power elevators having winding-drum driving machines with 1:1 roping, if of the babbitted rope socket type, shall be resocketed at the car ends at time intervals no longer than:

1. 24 months for machines located below or at side of the hoistway.
2. All drum to counterweight and drum to car ropes shall be resocketed every 24 months.

17.26: continued

(b) Tags. A metal tag shall be securely attached to one of the wire rope fastenings after each resocketing and shall bear the following information:

1. The name of the person or firm who performed the resocketing.
2. The date on which the rope was resocketed.

17.27: Governor Ropes

(1) Governor ropes shall be of uncovered iron, steel, or monel metal.

(2) Governor ropes shall not be of tiller rope construction.

(3) Governor ropes shall be not less than ⅜ inch in diameter.

(4) Governor ropes shall run clear of governor jaws during the normal operation of the elevator.

(5) Governor ropes shall run not more than ⅛" either side of the common center line of the governor jaws.

(6) Governor rope ends shall be fastened by tapered babbitted sockets or a wedge type clamp.

(7) Where socketed rope fastenings are used, the length of the socket shall conform to the requirements for wire rope sockets for hoisting ropes and shall be not less than 4.75 times the nominal diameter of the rope and shall be installed in such manner that all portions of the rope other than the portion within the socket shall be readily visible.

17.28: Governor Tail-Ropes

(1) Material Tail-Ropes. Tail-ropes shall be of iron, steel, monel-metal, phosphor bronze, or stainless steel, of regular-lay construction, and shall be not less than ⅜" in diameter.

(2) Tiller rope construction shall not be used.

(3) The factor of safety of governor ropes shall be not less than five.

(4) Tail-ropes shall be secured to car on counterweight safety operating drums by clamps or tapered babbitted sockets on the inside of the drum.

(5) Tail-ropes shall be connected to governor ropes by tapered babbitted sockets.

(6) Deflecting sheaves for tail-ropes shall be fastened by metal brackets to car frame safety planks.

17.29: Compensating Ropes or Chains

(1) Compensating chains shall be firmly secured to the car frame, the counterweight, or the hoistway.

(2) Compensating ropes shall be of uncovered iron or steel.

(3) Whenever compensating ropes are employed, a compensating rope tension sheave shall be installed in the elevator pit. This tension sheave shall be guided and equipped with a contact switch arranged to positively open the motor and brake operating circuits before the compensating sheave reaches its upper or lower limit of travel.

17.30: Guide Rails

(1) General. Guide rails for power elevator cars and counterweights shall be of steel, other than where the use of steel rails presents an accident hazard, as in chemical or explosive industries wood guide rails may be used.

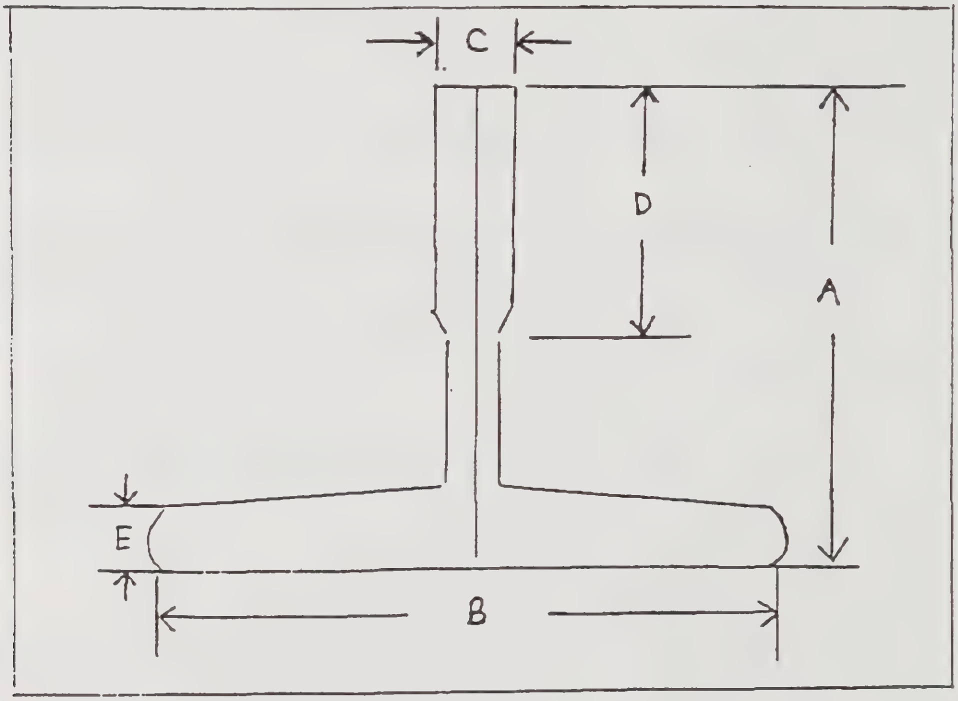
EXCEPTION: For passenger oil hydraulic elevators only, guide rails, guide rail brackets and their fastenings shall be of steel and may have other approved shapes subject to the following regulations:

(a) They shall have a section modulus and movement of inertia equal to or greater than that of a section shown in Figure 1 in 524 CMR 17.30(1) for a given condition.

(b) Welding may be used to fasten rail supports provided the welding is done by certified welders.

FIGURE 1.

T-Section Rail



17.30: continued

TABLE 1.

GUIDE RAIL DIMENSIONS - 524 CMR 17.30(1)

Nominal Weight Per Foot in Lbs.	Nominal Dimensions in Inches A	B	C	D	E
8	2-7/16	3½	⅝	1¼	5/16
11	2½	4½	⅝	1½	5/16
12	3½	5	⅝	1¾	5/16
15	3½	5	⅝	1-31/32	½
18½	4¼	5½	¾	1-31/32	½
22½	4	5½	1⅛	2	9/16
30	5	5½	1¼	2¼	11/16

(2) Length of Guide Rails.

(a) For hydraulic elevator where the car is secured directly to the top of a hydraulic plunger the guide rails shall be extended at the top and bottom to prevent the guide shoes from running off when the plunger is fully extended or fully compressed.

(b) For all other power elevators the guide rails shall be continuous from the bottom to the top of the hoistway.

(3) Weight of Guide Rails.

(a) The weight of steel guide rails shall not be less than given in the following table:

TABLE 2.

Total Weight of car and load. Total Weight of Counter weight per pair of rails (pounds).		Minimum weight of each car guide rail (pounds per linear foot).	Minimum weight of each counterweight guide rail (pounds per lineal foot).			
			With guide rail safeties		Without guide rail safeties	
Above:	To and including		1 to 1 Roping		2 to 1 Roping	
	4,000**		7.5**	7.5*	7.5	7.5
4,000	15,000		15.	15.	7.5	7.5
15,000	27,500		22.5	22.5	15.	15.
27,500	40,000		30.	30.	15.	15.

* If the rails are effectively bracketed or tied at intervals of six feet or less to prevent spreading, this load may be doubled. This applies only to 7½ pound rails and only when such rails are used for counterweights.

** If car guide rails weighing 7½ pounds were effectively bracketed or tied at ten foot intervals, the 4,000 lb. load may be increased to 4,500 lbs., and if bracketed or tied at 6½ foot intervals, this load may be increased to 5,000 lbs.

(b) Where cars equipped with duplex safety devices are employed, the Maximum Car and Load Weights given in Table 2 in 524 CMR 17.30 may be multiplied by the following factors based upon the vertical distance between centers of safeties:

17.30: continued

TABLE 3.

CAR DUPLEX SAFETIES

Distance Between Safeties in Feet	Multiply Maximum Load Given in Table I by
18 (or over)	2.0
15	1.83
12	1.67
9	1.50
6	1.33

(c) Where counterweights equipped with duplex-safety devices are employed, the Maximum Counterweight with Safety Weights given in Table 2 in 524 CMR 17.30 may be multiplied by the following factors based upon the vertical distance between centers of Safeties:

TABLE 4.

Distance Between Counterweight Duplex-Safeties	Factor
15' (or over)	2.0
10' to 14.99 incl.	1.67
5' to 9.99 incl.	1.33

(4) Joints of Steel Guide Rails. Joints of steel guide rails shall be:

(a) Accurately machined with tongue and groove through the webs at right angles to the base and through the flanges parallel to the base, and fitted with fishplates each secured with not less than four substantial bolts through each rail; or,

(b) Accurately machined with tongue and groove through the webs and with backs of the flanges where the fishplates bear accurately machined at right angles to the tongue and groove and fitted with finished fishplates each secured with not less than four substantial bolts through each rail.

(5) Guide Rail Bolts. Guide rail bolts for fishplates, ties, brackets, backing, clips through bolts, and supports shall be not less than the sizes given in the following table:

TABLE 5.

SIZE OF GUIDE RAIL BOLTS

Weight of Rails per Foot	Diameter of Bolt in Inches
7.5 lb. to 8.2 lb.	½
14.0 lb. to 16.0 lb.	⅝
22.5 lb. to 23.0 lb.	¾
30.0 lb. to 32.0 lb.	¾

(6) Guide Rail Brackets.

(a) Guide rails shall be securely fastened in position with brackets, through bolts, ties, clips, or backing of steel of such strength, design, and spacing that the guide rails and their fastenings shall not deflect between supports more than ¼" under normal operation. Welding may be used to fasten rail supports to building steel provided the welding is done by certified welders approved by the enforcing authority.

17.30: continued

(b) Where the supports are more than 14' on centers, rail backing shall be used regardless of the deflection under normal operation.

(c) Where an elevator is intended to handle heavy loads the guide rails, fastenings, backing, brackets, and supports shall be designed to sustain the thrusts imposed upon them when a concentrated load is on the car sill in addition to when the concentrated load is in place on the car platform.

(d) Guide Rail Brackets and Building Supports. Design and strength of Brackets and Supports.

The building construction forming the supports for the guide rails, and the guide rail brackets, shall be of such design as to:

1. Safely withstand the application of the car or counterweight safety when stopping the car and its rated load or the counterweight.
2. Withstand the forces specified in 524 CMR 17.16 within the deflection limits specified.

Where necessary, the building construction shall be reinforced to provide adequate supports for the guide rails.

(7) Bolt Holes. Bolt holes in steel beams for bracket bolts shall not exceed the diameter of the bolt by more than 1/16 inch. Such bolt holes shall be drilled or punched. They shall not be cut with a torch.

(8) Wood Guide Rails. Where the use of steel guide rails creates an explosion hazard, the use of wood guide rails is permitted, provided:

(a) The contract speed is not in excess of 100' per minute, and,
(b) The guide rails are of straight grained maple without knots, and,
(c) The size of the rails is either not less than 2" x 2½" where the car and load is not in excess of 5,000 lb. or not less than 2⅝" x 3" where the car and load is not in excess of 8,000 lb.

(9) Use of Car or Counterweight Safeties. Where car or counterweight safeties are used, the guide rails and their supports shall be capable of withstanding the application of the safety when stopping the car with contract load or the counterweight when descending at governor tripping speed.

17.31: Car and Counterweight Buffers

(1) Buffers of the spring, oil, or equivalent type shall be installed under cars and counterweights.

(2) Spring buffers may be used with elevators having a contract speed not in excess of 200 feet per minute.

Oil buffers shall be used with elevators having a contract speed in excess of 200 feet per minute.

(3) The minimum stroke of spring buffers shall be as follows, based on contract speed:

100 feet per minute or less --1½" stroke
101 to 150 feet per minute -- 2½" stroke
151 to 200 feet per minute -- four inch stroke

Note: Stroke as applying to spring buffers is the difference between the free length of the spring and its length when compressed to a point where all coils are practically in contact.

(4) The static load required to compress spring buffers a distance equal to their stroke shall be within a minimum of twice and a maximum of three times the total weight of the car plus contract load or of the counterweight, respectively.

17.31: continued

(5) Each spring buffer shall be provided with a metal plate marked in a legible and permanent manner to show the stroke or compression of the spring and the maximum and the minimum loads for which the spring may be used in conformity with this rule. This plate shall not be wired or attached to the spring coils in such manner as to become unfastened when the spring is fully compressed.

(6) The minimum stroke of oil buffers shall be based on the following:

(a) The stroke shall be such that the car or the counterweight on striking the buffer at 115% of contract speed shall be brought to rest with an average retardation not exceeding 32.2' per second.

(b) Where a speed retarding device is installed that will limit the speed at which the car or the counterweight can strike their buffers, the buffer stroke shall be based on at least 115% of such reduced striking speed and an average retardation not exceeding 32.2' per second. In no case shall the stroke used under such conditions be less than 50% of the stroke required by 524 CMR 17.31(6)(a), or less than 17", whichever is greater.

(7) Car and counterweight oil buffers shall develop an average retardation not in excess of 32.2' per second and shall develop no peak retardation greater than 80.5' per second having a duration exceeding 1/25th of a second with any load in the car from contract load to a minimum load of 150 lbs. when the buffers are struck with an initial speed of not more than:

(a) 115% of contract speed where no speed retarding device is used, and

(b) 115% of the pre-determined reduced speed for buffers where a speed retarding device is used.

(8) Oil buffers shall be provided with means for determining that the oil level is within maximum allowable limits. Glass sight gauges shall not be used.

(9) Buffers shall be located symmetrically with reference to the vertical center line of the car frame or the counterweight frame within a tolerance of two inches.

(10) Counterweight buffers similar to those required for cars shall be installed symmetrically under the counterweights of power elevators.

(11) Car and counterweight oil buffers shall be field tested by running on to them with the car and contract load and the counterweight, respectively, at contract speed with the normal terminal slow-down device inoperative and final limit switches operative. Where a speed retarding device is installed the buffers shall be field tested by running on to them at the reduced striking speed with the car and contract load and the counterweight, respectively, with the normal terminal slow-down device and the speed-retarding device inoperative, and final limit switches operative.

(12) Car and counterweight oil buffers when installed and filled with oil shall be fully compressed and, when released, the buffers shall return to the fully extended position within 90 seconds.

(13) Buffers of the spring return type shall be tested for plunger return with a 50 lb. test weight resting on the plunger during the test. The plunger shall be depressed two inches and, when released, the plunger while supporting the test weight, shall return to the fully extended position within 30 seconds.

(14) No field test of spring buffers is required.

(15) Car and counterweight oil buffers may be compressed not to exceed 25% of their stroke when the car is level with the terminal landings.

17.31: continued

(16) Every oil buffer installed shall be provided with a metal plate marked by the manufacturer in a legible and permanent manner indicating:

- (a) The maximum and the minimum loads and the maximum striking speed for which the buffer may be used.
- (b) The permissible range in viscosity of the buffer oil to be used at 100°F.
- (c) The viscosity index number of the oil to be used.
- (d) The pour point in degrees F. of the oil to be used.

17.32: Counterweights

(1) Counterweights shall run on guide rails within the elevator hoistway.

(2) Where two counterweights run on the same guides, the car counterweight shall be above the machine counterweight and there shall be a clearance of not less than eight inches between the counterweights. The ropes of the machine counterweight shall be covered or protected by metal or fiber sleeves firmly attached to the rope. These sleeves shall be not less than six inches longer than the car counterweight. The ends of metal sleeves shall be carefully reamed before being placed on the ropes.

(3) Where an independent car counterweight is used, it shall be of a weight to prevent undue slackening in any of the ropes during acceleration or retardation of the car.

(4) All counterweight sections shall be secured by at least two tie rods passing through holes in all the sections. The tie rods shall have lock nuts at each end, secured by cotter pins.

(5) Counterweights shall be located only in the hoistway of the elevators to which they are connected.

(6) No elevator car shall counterbalance another car.

17.33: Control and Operating Devices and Systems: General

(1) The frame of the electric elevator machine, the frame of the controller, and frames of electric appliances in or on the elevator car shall be effectively grounded.

(2) No circuit-breaker operated automatically by a fire alarm system shall cut off the power of a power elevator.

(3) Each electric power elevator driven by a polyphase alternating-current motor shall be provided with a device which will prevent starting the motor if:

- (a) the phase rotation is in the wrong direction, or,
- (b) there is a failure in any phase.

524 CMR 17.00 does not apply to AC motor used to drive motor-generator sets.

(4) Where an overload circuit-breaker is used for a direct current electric elevator, the wiring shall be arranged so that the circuit of the brake-magnet coil is opened at the same time that the line circuit is opened.

(5) Electric slack-rope switches shall be enclosed.

(6) The installation of condensers which may either by functioning or failure cause an unsafe operating condition is prohibited.

(7) No person shall at any time make any required safety device or electrical protective device inoperative, except where necessary during tests, inspections, and maintenance. Immediately upon completion of such tests, inspections, and maintenance, such devices shall be restored to their normal operating condition in conformity with applicable requirements of this code.

17.33: continued

(8) Operation of an elevator in a leveling zone at any landing by a car-leveling zoning device when the landing doors and/or the car gates or doors are not in the closed position, is permissible subject to the following:

(a) Operating devices of the manually operated car-leveling devices shall be of the continuous pressure type located in the car.

(b) Car-platform guards conforming to 524 CMR 17.05(3) and 17.05(4) shall be provided; and where a car-leveling device is used, landing sill guards conforming to 524 CMR 17.13(9) shall also be provided.

(c) The landing zone at any landing shall not extend more than 30" above and 30" below any landing where an automatic leveling device is used, and not more than eight inches above and below where a manually operated leveling device is used.

17.34: Control Devices

(1) A fused disconnect switch on a circuit breaker shall be installed and connected into the power supply line to each elevator and dumbwaiter motor or to the motor of the motor generator set and controller. Disconnect switches or circuit breakers shall be of the manually closed multi-pole type, and their location shall conform to 524 CMR 17.34(2). Where circuit breakers are used as a disconnecting means, they shall not be of the instantaneous type and shall not be opened automatically by a fire alarm system. Where there is more than one driving machine in a machine room, disconnect switches or circuit breakers shall be numbered to correspond to the numbers of the driving machine which they control. (See 524 CMR 17.22(9))

(2) The fused disconnect switch or circuit breaker shall be of the manually closed multi-pole type, and shall be located adjacent to and visible from the elevator machine or motor-generator set to which it is connected and shall be located in the machine room at the lock-jamb side of the entrance door. The switch shall be located not more than 18" from the lock-jamb side of the entrance door and should not extend more than five feet six inches above the landing.

(3) No provision shall be made to close the disconnecting switch from any other part of the building.

(4) No control system shall be used which depends on the completion or maintenance of an electric circuit for the interruption of the power and the application of electro-mechanical brakes at the terminals, for the application of safeties, or for the closing of contractor by an emergency button. 524 CMR 17.00 does not apply to dynamic braking or to speed control devices.

(5) On electro-hydraulic elevators all stop valves shall be arranged so to be opened electrically and to be closed either by gravity or by springs in compression, or by hydrostatic pressure, or by any combination of the above.

17.35: Operating Devices

(1) No power elevator shall be operated by a direct hand-operated rope, cable, or rod, or by a wheel or lever mechanism which motivates an operating rope or cable.

(2) The maximum rated system or circuit voltage permitted in the operating devices of power elevators shall be 250 volts.

(3) The handle of car-switch operating devices shall be arranged to return to the "stop" position and lock there automatically when the hand of the operator is removed.

(4) Where more than one operating device of the car switch or continuous pressure type is used in a car, the operating devices shall be so interlocked that only one can be used at a time.

17.35: continued

(5) Where a single operating device is used, it shall be so located as to be near the car opening serving the greatest number of landing openings.

(6) An emergency stop switch which will cut off the sources of power shall be provided in the car adjacent to the operating device for all elevators and shall be suitably identified and of a distinctive color.

(7) Emergency stop switches may be operated by buttons or levers but shall be of the manually opened and closed type so installed that when opened gravity will not tend to close the switch.

(8) An emergency stop switch shall be installed in the pit and on top of the car of every electric elevator, electric hydraulic elevator, and every hydraulic elevator equipped with an electrically operated valve. *An emergency switch shall not be required on elevators equipped with hoistway covers or mechanical brakes.* An emergency switch shall be installed in the pit of all elevators equipped with hoistway covers and an electric brake. The switch in the car top shall be located vertically near the center of the car crosshead facing the front of the car. The switch in the pit shall be located vertically not more than six inches below the top of the pit, and not to exceed two feet from the face of the landing opening in full view of the landing near the front of the car. When access to the pit is by means of an access door, this switch shall be so located as to be accessible from the pit access door. Where access to the pits of elevators in a multiple hoistway is by means of a single access door, the stop switch for each elevator shall be located adjacent to the nearest point of access to its pit from the access door. Every car top and pit emergency switch shall be provided with a red metal plate marked "EMERGENCY", permanently and securely fixed to the front of the switch. The height of the lettering shall be not less than ¼".

(9) Contact of emergency stop switches or buttons shall be directly opened mechanically and shall not be solely dependent upon springs for the opening of the contacts.

(10) There shall not be installed on the top of any elevator car any permanent switches or buttons for the purpose of operating the car. This regulation shall not prevent the use of temporary operating devices by a licensed elevator mechanic for construction, inspection and testing purposes, provided that such devices are operative only when the normal operating devices are inoperative and all hoistway doors are closed and locked.

(11) A rigidly mounted operating switch without extension cords may be mounted on the top of the car for the purpose of operating the car for construction, inspection and testing purposes, subject to the following:

(a) The operating switch shall conform to the following requirements:

1. It shall be of the continuous-pressure button-operated type with the operating buttons located flush with the switch box cover plate and shall be permanently marked, "CAR TOP SWITCH" in letters not less than ¼" high.

2. It shall be located on top of the car crosshead and on that side of the car which is nearest the car door.

3. It shall operate the car subject to the following:

At a speed not exceeding 150 feet per minute.

Only when the car door gate is closed and all hoistway doors are closed, and where required by the code, locked.

Only when all car and landing operating devices are inoperative and the movement of the car is solely under the control of this switch.

(b) The operating switch shall be made inoperative, subject to the limitations specified in 524 CMR 17.35(11)(a)3. only by the operation of a control switch conforming to the following requirements:

1. The control switch shall, except as provided in 524 CMR 17.35(11)(b)3., be located in the car operating panel or in a separate panel located adjacent to the operating panel.

17.35: continued

2. The control switch shall be operated by a cylinder type lock having not less than a five pin or five disc combination which shall not be operable by any key which will operate any other lock or device used for any other purpose in the building, except the key operating the access switch permitted by 524 CMR 17.07(5).
3. The control switch key shall be removable in either the OFF or ON position.
4. The control switch key shall be available to and used only by licensed elevator mechanics or an authorized state, city, town or casualty insurance inspector.
5. In lieu of locating the key control switch in or adjacent to the car operating panel it may be mounted on the elevator controller in the elevator machine room.

(c) Separate additional means of the continuous pressure type may be provided on the car top to make power door operating devices and automatic car leveling devices operative for testing purposes.

(12) One lead to the emergency stop switch shall be run to the car through a separate and independent traveling cable where elevators have winding-drum machines.

[(13) Reserved]

(14) Where springs are used to break the circuit to stop an automatic-operation elevator at the terminal, they shall be of the compression type.

(15) The completion of another electric circuit shall not be depended upon to break the circuit to stop an automatic-operator elevator at the terminals. The interruption of the electric circuit shall prevent the movement of the car.

(16) Levers of operating devices for car switch operation elevators shall be so arranged that the movement of the lever toward the car gate which the operator usually faces will cause the car to descend and the movement of the lever away from the gate will cause the car to ascend. The direction of travel shall be indicated on the car switch.

(17) Automatic-operation elevators shall conform to the following requirements:

(a) When the car has started for a given landing, no impulse may be given from any landing to send the car in the reverse direction until the car has reached the destination corresponding to the first impulse. The car may stop at any intermediate landing to take on or discharge passengers going in the original direction.

(b) When the car has been stopped to take on or discharge passengers and is to continue in the direction determined by the first impulse, the car may be started by the closing of the car door or gate contact.

(c) The car cannot be started under normal operation by the operating devices unless every hoistway door is closed and locked in the closed position and every car-door or gate is closed in the closed position.

(18) Continuous-pressure operation shall not be used for elevators unless they are provided with all of the safety devices required for automatic operation.

(19) Load-weighing devices which will prevent operation of the elevator shall not be installed in connection with passenger elevators.

(20) Operation of an elevator in a leveling or truck zone at any landing by a car-leveling or truck-zoning device, when the landing doors and/or car doors or gates are not in the closed position, is permissible subject to the following:

(a) Operating devices of manually operated car-leveling devices or truck-zoning devices shall be of the continuous pressure type located in the car. See 524 CMR 17.05(3)(b).

(b) Car-platform guards conforming to 524 CMR 17.05(3) shall be provided; and where a car-leveling device is used, landing-sill guards conforming to 524 CMR 17.05(3) shall also be provided.

(c) The leveling zone at any landing shall not exceed more than 30" above and 30" below any landing where an automatic leveling device is used, and not more than eight inches above and below where a manually operated leveling device is used.

17.35: continued

(d) The truck zone at any landing shall not extend more than five feet six inches above the landing.

(e) Where a truck or leveling zone for one hoistway entrance extends into the door interlocking zone for a second entrance, the truck zoning or leveling operation shall be inoperative unless the hoistway door at the second entrance is in the closed position.

Where a truck or leveling zone for one hoistway entrance extends into the leveling zone for a second entrance, the leveling operation for the second entrance shall be inoperative while the hoistway at the first entrance is open.

EXCEPTION: The car may be operated by a car-leveling device at any landing having two hoistway entrances within two inches of the same level, with both car doors or gates and the corresponding hoistway doors open, provided landing-sill guards conforming to 524 CMR 17.05(4) are installed at both floors.

(21) A stop switch conforming to the requirements of 524 CMR 17.35(8) shall be provided for each elevator in the overhead machinery space in the hoistway, adjacent to the lock jamb side of the door.

17.36: Terminal Stopping

(1) Power elevators shall be provided with upper and lower normal terminal stopping devices arranged to stop the car automatically from any speed attained in normal operation within the top and bottom overtravel independently of the position of the operating devices and the final terminal stopping devices and before the buffer is fully compressed.

(2) Normal terminal stopping devices shall be installed in connection with power elevators as follows:

(a) Electric power elevators having winding-drum machines shall have stopping switches on the car or in the hoistway, operated by the movement of the car.

(b) Electric power elevators having traction machines shall have stopping switches on the car, or in the machine room or in the hoistway operated by the movement of the car. If located in the machine room, the stopping contacts shall be mounted on and operated by a stopping device mechanically connected to the car, and with no dependence on friction as a driving means. An automatic safety switch shall be provided which will stop the machine should the tape, chain, rope, or other similar device mechanically connecting the stopping device to the car, fail. In the case of electric power elevators using floor controllers or other similar devices for automatic stopping at the floor landings, only one set of floor-stop contacts is necessary for each terminal landing, provided these contacts and the means for operating them comply with the requirements for terminal stopping devices. These contacts then serve also as normal terminal stopping devices.

(c) Hydraulic elevators having a contract speed in excess of 100' per minute shall have an automatic stop valve independent of the normal control valve or valves, operated either by the car or the machine.

(3) Electric power elevators shall be provided with upper and lower final terminal stopping devices arranged to stop automatically the car and counterweight from contract speed within the top clearance and bottom overtravel independently of the operation of the normal terminal stopping devices and the operating device, but with buffers operative. Final-limit switches shall be set to operate with the car as close to the terminal landing as practical without interfering with the normal operation of the elevator. Where spring buffers are provided, the final-limit switches shall be set to open before the buffer is engaged. Where oil buffers are provided and also means to prevent jumping of the car or counterweight, the final-limit switch shall open before the buffer is fully compressed.

(4) Final terminal stopping devices shall be installed in connection with electric power elevators as follows:

(a) Electric power elevators having winding-drum machines shall have stopping switches on the machines and also in the hoistway operated by the movement of the car.

17.36: continued

(b) Electric power elevators having traction machines shall have stopping switches in the hoistway operated by the movement of the car.

(c) Final terminal stopping devices are not required on electrohydraulic elevators.

(5) The final terminal stopping device shall act to prevent movement of the car in both directions of travel. The normal and final terminal stopping devices shall not control the same switches on the controller unless two or more separate and independent switches are provided, two of which shall be closed to complete the motor and brake circuit in each direction of travel.

When two-phase or three-phase alternating current is used to operate the elevator, the above switches shall be of the multi-pole type. If the final terminal stopping device controls the same controller switch or switches as the operating device or the normal terminal stopping device, it shall be connected into the control circuit on the opposite side of the line.

(6) Chain, rope, or belt driven final machine terminal stopping devices shall not be used for power elevators having winding-drum machines.

(7) Electric power elevators having winding-drum machines driven by two-phase or three-phase alternating-current motors shall have the mainline circuit to the motor and brake directly opened either by contact in the machine stop-motion switch or by hoistway limit switches operated by a cam attached to the car.

The opening of these contacts shall take place before or coincident with the opening of the final terminal stopping device and shall prevent movement of the machine in either direction. Elevator machines with alternating current motors and direct current brakes and direct current mainline potential switches controlled by final terminal hoistway stopping switches do not require a mainline machine stop motion switch.

(8) Normal and final terminal stopping switches, whether on the car or in the hoistway, shall be of enclosed type. Normal and final terminal stopping devices, where on the car or in the hoistway, shall be securely mounted in such a manner that the movement of the switch lever or roller to open the contacts shall be in a direction as nearly at right angle as is possible to a line drawn between the face of the car guide rails. The cam or cams for operating the terminal stopping switches shall be of metal and shall be so located and of sufficient length to maintain the switch in the open position when the car is in contact with the overhead structure or resting on the fully compressed buffer with the overhead structure and the buffer in their normal position.

(9) The contacts of all terminal stopping devices shall be directly opened mechanically. Spring or gravity arrangements permitting the opening of the contact on withdrawal of the cam, lug, or similar device are prohibited.

17.37: Signals

(1) Landing Signals. Every power elevator, other than continuous pressure operation, automatic operation type elevators and elevators arranged to stop automatically at the floor landings, shall be equipped with a signal system indicating the landing at which the car is desired.

(2) Emergency Signals. Every elevator shall be provided with an emergency signal audible outside of the hoistway, that is operative from within the car or shall be provided with a telephone connected to a switchboard in the building. Where a telephone is used in an automatic or continuous pressure operation elevator, in place of an audible emergency signal, it shall be connected to a switchboard in the building which is continuously manned or permanently connected with a central exchange.

17.38: General

(1) Installations Placed Out of Service. When installations governed by 524 CMR 15.00 through 35.00 are placed out of service for a definite period, the following precautions must be taken.

(a) The elevator inspector having jurisdiction must be notified by the owner, lessee, or agent, so that said inspector can make his recommendations.

(b) Periodic and maintenance inspections and tests may be discontinued for the out-of-service period.

(c) Before such installation is again placed in service, it shall be subject to a complete inspection test in accordance with M.G.L. c. 143, § 64, as amended, provided the out-of-service period exceeds one year.

(2) Connections. Connections between members of car frames and platforms shall be riveted, bolted, or welded, and shall conform to the following:

(a) Bolts. Bolts, where used through sloping flanges of structural members, shall have boltheads of the tipped-head type or shall be fitted with beveled washers.

(b) Nuts. Nuts, used on sloping flanges of structural members, shall seat on beveled washers.

(c) Welding. Welding of all parts of apparatus governed by 524 CMR 15.00 through 35.00 and upon which safe operation depends shall be done in accordance with the appropriate standards established by the American Welding Society.

(3) Information on Elevator Layouts. Elevator layout drawings shall, in addition to other data, indicate the following:

(a) Bracket spacing.

(b) The estimated vertical force on the guide rails on application of the safety device.

(c) In case of freight elevators for Class B or C loading (see 524 CMR 17.15(3)), the horizontal forces on the guide rail faces during loading and unloading, and the estimated maximum horizontal forces in a post-wise direction on the guide rail faces on the application of the safety device.

(d) The size and weight per foot of any rail reinforcements where provided.

17.39: Fire Emergency Service - Automatic Elevators

(1) All automatic elevators having a travel of 70 feet or more from the lowest accessible grade elevation surrounding the building shall, as of the dates listed below, be provided with fire emergency service:

(a) New installations

(b) All elevators installed prior to June 7, 1972, shall as of January 1, 1980, comply with 524 CMR 17.39(2) through (5).

(c) All automatic elevators having a travel of 25 feet through 70 feet shall be required to be equipped with the firefighters capture requirements. (524 CMR 17.39(2)(a) through (c) inclusive).

(2) Firefighter's Keyed Switch Operation. Firefighter's keyed switch operation shall be installed and operated in accordance with the following to permit the local fire department to commandeer and operate elevator(s) for firefighting purposes.

(a) Main Floor Firefighter's Keyed Switch. The firefighter's keyed switch shall be a three position (on, off, by-pass) key operated switch located on the main floor wall or, where necessary, at a lower level that may be used as an entrance by the local fire department. Said switch shall be immediately adjacent to the elevator or bank of elevators and shall have an identification plate engraved or lettered "Firefighter's Switch", with lettering a minimum of 14 point size and colored red. Key shall be removable in the "on" and "off" positions, but not in the "by-pass" position.

(b) Operation. When the firefighter's keyed switch is placed in the "on" position the following shall take place relative to elevators controlled by said switch:

1. Elevators traveling to the main floor shall continue non-stop to the main floor.
2. Elevators traveling away from the main floor shall reverse direction at the next available floor, with doors remaining closed, and return non-stop to the main floor.

17.39: continued

3. Elevators stopped at floors other than the main floor with the doors open. An audible alarm will sound, the doors will close immediately rendering all door opening devices inoperative, other than the door open button and the elevator shall return non-stop to the main floor.
4. All elevator cars shall return to the main floor.
5. Door reopening devices for power operated doors which may be affected by smoke or heat shall be rendered inoperative.
6. Elevators shall not respond to floor call button or switches.
7. When elevators arrive at the main floor, their doors shall open and remain open.
8. No system shall be incorporated or designed to override the firefighters key switch except emergency stop switches, inspection switches and those specified in 524 CMR 17.39(2)(b)9. without prior written approval of the Board.
9. Smoke detectors shall be installed in each elevator lobby at each floor and associated machine room with an approved heat or smoke sensing device or combination. The activation of any two or more detectors in the same elevator lobby or elevator machine room, other than at the designated level, shall cause all cars in all groups that serve that lobby to return non stop to the designated level. The operation shall conform to the requirements of 524 CMR 17.39(1) and (4). If heat or smoke detectors at the designated level is activated, the cars shall return to an alternative level. Smoke detector activation shall only be reset manually.
10. Should a detector activation cause a return of a car(s) as specified in 524 CMR 17.39(2)(b)9., the by-pass switch, when in the by-pass position, will allow normal operation of the car(s). Firefighters key shall be installed at alternate floor.

(c) Return to Normal Service. When it is considered safe to do so by the fire department officer in charge, elevators shall be returned to normal service by moving the keyed switch to the "off" position.

(d) Elevator Car - Firefighter's Keyed Switch. A firefighter's keyed switch shall be provided in 50% of all automatic passenger elevators in each bank of elevators, except that in duplex operation each elevator shall have a firefighter's keyed switch in each car. Said switch shall be installed in or immediately adjacent to the operating panel of the car for the purpose of placing the elevator on emergency fire service. Switch shall be identified by a plate engraved or lettered "Firefighter's Switch" in lettering a minimum of ⅛" (14 point size) and colored red. Key to said switch shall be removable in the "on" and "off" positions.

1. When on emergency fire service, an elevator shall be operated by and be under the sole control of a member of the local fire department who shall remain inside the elevator car and maintain control of the elevator throughout the fire emergency.
2. Elevators shall not respond to floor call buttons or switches.
3. The opening of power-operated doors shall be controlled only by continuous pressure "open" buttons or switches. If the switch or button is released prior to the door's reaching the fully open position the doors shall automatically reclose. Open doors shall be closed by either the registration of a car call or by pressure on the "door close" switch or button.
4. Landing door interlocks shall not be rendered inoperative.
5. Effective June 1, 1988. Should the firefighter's key in the elevator car be turned to the off position, car operation will revert to recapture function and return to the main floor. All cars installed prior to June 1, 1988 shall comply as of June 1, 1990.
6. Firefighters keyswitch at the main and/or alternate floor has to be turned to the "on" position before the firefighters keyswitch in the car becomes active.

(e) Keys for firefighters keyed switches shall be uniform throughout the Commonwealth of Massachusetts.

(3) Two-Compartment Elevators.

(a) The firefighter's keyed switch shall be located in both the upper and lower car compartments.

(b) When the elevator is operated on emergency service, the upper and lower car compartments shall be emptied of all passengers before the car is operated on firefighter's service. This shall be the responsibility of the building owner or his agent, and of the fire department.

17.39: continued

(4) Fire Emergency Sign re. Use of Stairways. There shall be a sign securely fastened to the wall over every hall button station. Minimum size shall be 3¼" x 2¼". The lettering shall be impressed or engraved on a contrasting background, and shall read and be sized as follows:

In Case of	⅛ inch equals 14 point lettering Color: Black
Fire	⅜ inch equals 30 point lettering Color: Red
In This Building	⅛ inch equals 14 point lettering Color: Black
Use Exit Stairways	3/16 inch equals 16 point lettering Color: Red
Do Not Use This Elevator	⅛ inch equals 14 point lettering Color: Black

(5) Responsibility of the Fire Department.

(a) On completion of the elevator installation and safety test, the elevator inspector shall notify the local fire department to have an authorized representative available to receive instructions by the elevator manufacturer or his agent on the purpose, operation, and use of the firefighter's keyed switch.

(b) All elevators operated by the use of the firefighter's keyed switch and the safety of all persons carried by or permitted to use such elevators during firefighting operations shall be the sole responsibility of the local fire department during firefighting operations.

(c) The opening of car doors and landing doors and the closing of same shall be the sole responsibility of the local fire department during firefighting operations.

(d) When elevators or elevator machine rooms have been involved in damage by a fire the local fire department shall notify the state or local elevator inspectors having jurisdiction. A thorough inspection shall be made by authorized elevator inspectors to determine that all systems continue to function as required by applicable code rules.

(6) Auxiliary Generators for Emergency Power. An auxiliary generator shall be provided of sufficient capacity and proper rating to supply elevator circuits in conjunction with the installation of the firefighter's key switch installation (see 524 CMR 17.39(2) of foregoing). Said auxiliary generator shall be capable of handling the emergency load and shall start automatically within 25 seconds from the time the normal power has dropped to a pre-determined value as sensed by the automatic starting device for the auxiliary generator. The auxiliary generator shall have sufficient power to operate at least one elevator at a time on firefighter's keyed switch service with full load at a minimum of one third it rated speed with a maximum of 500' per minute. The system shall have the capability to transfer the emergency power to any elevator car on emergency firefighter's service through transfer switch arrangements or other suitable means.

EXCEPTION: All automatic passenger elevators having a travel of less than 70 feet will be exempt from the requirements of 524 CMR 17.39(6).

(7) Penalty. Any person violating or failing to comply with any provision of 524 CMR 17.39 or any regulation established thereunder shall be punished by a fine of not more than $500.00.

17.40: Medical Emergency

(1) Medical Emergency Elevators.

(a) All new buildings of two or more floors for which building permits were issued on or after January 20, 1989 shall be provided with at least one passenger elevator designed to accommodate the loading and transportation of an ambulance gurney or stretcher (22 ½" wide by 75" long) in its horizontal position. This elevator shall serve all landings of the building or if the building is divided into banks one car in each bank shall conform to 524 CMR 17.40.

(b) Elevators installed after January 20, 1989 which have E.M.S. features, or equipment that is being installed, or was on order prior to the filing date of this change, shall conform to these requirements by June 1, 1993.

(c) The hoistway and car shall be provided with power operated passenger type horizontally sliding doors, minimum size to be 42" wide by 78" high.

17.40: continued

(d) The elevator car shall have a minimum inside dimension of 80" by 54" arranged for the entry of the gurney in a supine position. The platform dimensions and/or the clear entrance opening dimension may be altered where it can be demonstrated, prior to installation, that the car and entrance configuration to be provided shall handle the designated gurney or stretcher with equivalent ease.

(2) Medical Emergency Key Switches and Markings.

(a) This elevator shall be controlled by a two position key switch at the main floor of a building and by a similar key switch in the car operating panel. The lock and key shall be that manufactured by Medeco Security Locks, Inc. and the key number shall be 65W-2650-T101-26-R7. The lock shall be arranged so that the switch shall be off when the key is in a vertical position and it shall be on when the key cut is facing approximately 90° to the right of the vertical. The key shall only be removable in the off position.

(b) Only Elevator Companies or manufacturers authorized by the Massachusetts Department of Public Safety, Elevator Section may order this lock.

(c) Only personnel authorized by the Massachusetts Department of Public Safety, Elevator Section may purchase this key.

(d) Both locks shall be identified with the words "MEDICAL EMERGENCY" engraved adjacent to the lock. The lettering shall be a minimum of 14 points with lettering or background color blue.

(3) Medical Emergency Operation.

(a) When the main floor key is turned to the on position, it shall activate a continuous audible signal in the car which can be the same signal used for fireman's service. It shall also activate a visual signal in the car and at the main floor key call station that reads Medical Emergency. All car calls shall be canceled and be unable to be re-registered. The car shall not accept any hall calls after this service is activated.

(b) When the car is in motion, the in car stop switch shall be de-activated.

(c) When the car is moving toward the main floor it shall return non-stop and open its doors on arrival. It shall not comply with 524 CMR 17.40(3)(b), until the car begins to move.

(d) When the car is moving away from the main floor it shall reverse direction at the next available floor without opening its doors and return non-stop to the main floor.

(e) When the car is at a floor, other than the main floor with its doors open, they shall close without delay, and the car return to the main floor.

(f) The car shall return to the main floor after being called by the EMS main floor switch and open its doors even if the main floor EMS key switch has been returned to the off position during travel. On arrival at the main floor the audible signal in the car shall cease.

(g) Upon arrival at the main floor the doors shall open and if the main floor EMS key switch is "on" they shall remain open until that switch is turned "off". If the main floor EMS key switch is "off" the visual signals shall remain illuminated for a minimum of 60 seconds. During this delay the EMT must insert his key into the car control panel and turn it to the "on" position to retain control of the car. Upon expiration of the delay, without the key in the car being turned on the car shall return to normal service.

(h) If the elevator is an automatic car with attendant or independent service operation it shall activate its audible and visible signal and if on attendant service shall return to automatic operation after a minimum of 15 seconds and a maximum delay of 60 seconds and then proceed to the main floor.

(4) Car Operation.

(a) Upon entering the car it shall not accept a car call until the in car EMS key switch is turned to the on position. After turning that key on and registering a call, the car shall automatically close its doors and proceed to the call. All door zone detection devices shall be operative. If more than one call is registered, it shall stop at the first call and cancel all others at which time a second choice can be made.

17.40: continued

(b) Upon arriving at the desired floor, the doors shall open automatically and the EMT shall remove his key when the switch is in the off position, the car shall then remain at that floor and will not accept a call or move away from that floor until the key is again turned on.

(c) The car must be returned to the main floor on EMS service and the key removed in its off position before returning the car to normal operation.

(d) If the car is on any form of special service such as inspection, firefighters, etc., when EMS service is initiated the audible and visible signals in the car shall be activated but the car shall not respond to the main floor EMS call.

(e) If the car has responded to a Medical Emergency call prior to a call for fireman's service, the EMT call for service shall not be overridden by firefighters service call until it returns to the main floor but the fireman's service audible and visible signals shall be activated.

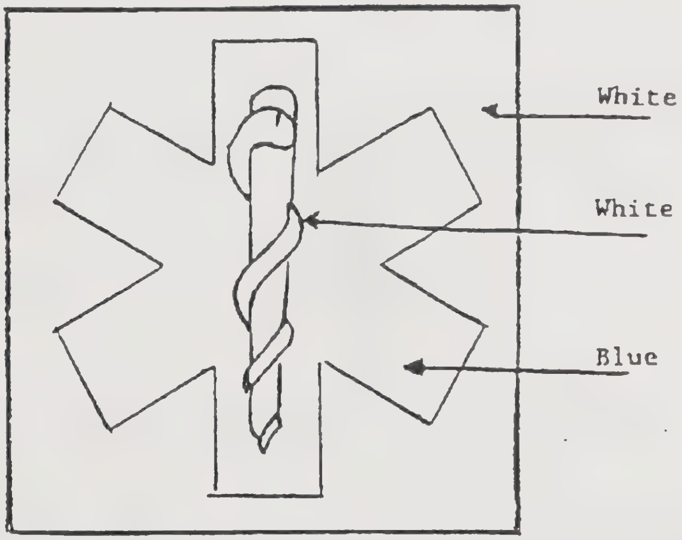
(5) Designation. Medical Emergency Service shall be identified as follows:

(a) At the main floor this elevator shall be identified by the national medical symbol (star of life), shown below.

(b) These symbols (two) shall be permanently attached to the hoistway door frame on each side of that frame at right angles to the sill at a height not less than 66" and not more than 78" above the floor level at the sill.

(c) The symbol shall be blue in color with contrasting background, the staff and serpent shall be white.

(d) The symbol itself shall be two to three inches in height.



(6) Exceptions: The following elevator installations need not comply with 524 CMR 17.40:

(a) Elevators in structures such as rock quarries, steel towers, dams, storage bins, smoke stacks, tanks (and other special industrial installations) where the elevators are used only by maintenance and operating personnel or in hospitals where the normal services of an EMT are available.

(b) Elevators in buildings or structures where each landing is at ground level or is accessible to ground by a ramp.

(c) Elevators in buildings or structures equipped with stairs that extend no more than one floor above or below the building entrance grade and with a configuration that shall accommodate the carrying of a gurney or stretcher on said stair and when said stair conforms to 780 CMR *et seq.* (the Massachusetts State Building Code) and is permitted by the authority having jurisdiction.

17.40: continued

REGULATORY AUTHORITY

524 CMR 17.00: M.G.L. c. 143, § 69.

524 CMR 18.00: HAND ELEVATORS

Section

18.01: Hoistway Enclosures: General
18.02: Machine Rooms
18.03: Venting of Hoistways
18.04: Hoistway Guards
18.05: Thoroughfares
18.06: Pipes and Wiring
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18.11: Contract-Load Test of Car Safety Devices
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18.14: Guide Rails
18.15: Counterweights

18.01: Hoistway Enclosures: General

(1) The hoistways of all elevators shall be enclosed throughout their height.

(2) Where the elevator shaftway penetrates any fully enclosed solid floor above the bottom landing, the walls shall be of not less than two hour fire resistive rating, and in addition any portion of the walls exposed to automotive traffic shall be of solid masonry not less than eight inches in thickness to a height of not less than four feet six inches above finished floor.

(3) Where the elevator either serves only open construction floors or serves only open balcony floors within one story, the wall shall be of non-combustible materials of either solid construction or open metal construction which will reject a two-inch ball, provided such open construction fronts or panels are not less than two inches from any moving equipment within the enclosure. Where less than two inches from moving equipment, open construction shall reject a ½ inch ball.

(4) Hoistway windows shall be located only in exterior walls of the building, or in hoistway walls above the roof.

(5) Not more than two elevators shall be installed in the same hoistway.

(6) The dividing wall partition which is located within an elevator hoistway shall be constructed with a solid wall of not less than ¾ fire resistive construction.

(7) Where a hoistway extends into the top story of a building, fire-resistive hoistway or machinery enclosures, where required, shall be carried to the underside of the roof if the roof is of fire-resistive construction, and at least three feet above the top surface of the roof if the roof is of non-fire-resistive construction.

(8) Where hoistway enclosures are not required to continue through the roof, the top of the hoistway shall be of fire-resistive construction equivalent to that required for the walls.

18.02: Machine Rooms

(1) Machine rooms shall be located above or adjacent to any side of the hoistway.

(2) Machine rooms located above any hoistway shall be provided with a flooring which is either above or level with the top of the machine supporting beams. Machine room floors shall be designed to support a uniformly distributed load of not less than 50 lbs. per square foot.

18.02: continued

(3) Machine room enclosures shall be constructed as follows:

(a) Where solid construction hoistways are required by 524 CMR 18.00, the walls shall be of not less than two hour fire-resistive construction, other than for doors, windows, louvers, or ventilators.

(b) Where open construction hoistways are permitted by 524 CMR 18.00, the walls shall be of non-combustible materials which shall be either solid construction walls, or open metal construction which will reject a two-inch ball, and shall be not less than six feet high.

(c) Where the machine room is located within the building and where solid construction hoistways are required by these regulations, the ceiling of each machine room shall be of not less than two hour fire-resistive construction.

(d) Where an open construction hoistway is permitted, the machine room ceiling may be omitted.

(4) Elevator machine rooms shall not be used as public thoroughfares.

(5) Loads on overhead beams and their supports shall be computed as follows:

(a) The total load on overhead beams shall be assumed as equal to the weight of all apparatus resting on the beams plus twice the maximum load suspended from the beams.

(b) The load resting on the beams shall include the complete weights of machine, sheaves, etc. The load suspended from the beams shall include the sum of the tensions of all ropes suspended from the beams.

(6) The required factor of safety for all overhead beams and their supports, based upon both the average ultimate strength of the material and the loads shall not be less than five.

18.03: Venting of Hoistways

(1) General. Hoistways of elevators serving more than three stories shall be provided with means for venting smoke and hot gases to the outer air in case of fire.

EXCEPTIONS: Hoistways not extending into the top story of a building, other than hotels, apartment houses, hospitals, and similar buildings with overnight sleeping quarters, where the hoistways are equipped with approved automatic sprinklers connected to the building water-supply system or to an approved automatic sprinkler system. (In case any question arises as to what is the best practice, work done in accordance with the requirements of NBFU Standards No. 13, entitled "Sprinkler Systems", dated June, 1953, will be considered as compliance.)

(2) Location of Vents. Vents shall be located:

(a) In the side of the hoistway enclosure directly below the floor or floors at the top of the hoistway, and shall open directly to the outer air or through incombustible ducts to the outer air; or,

(b) In the wall or roof of the penthouse or overhead machinery space above the roof, provided that openings of at least equivalent area are provided in the floor or floors at the top of the hoistway.

(3) Area of Vents. The area of the vents shall be not less than 3½% of the area of the hoistway nor less than three square feet for each elevator car, whichever is greater. Of the required vent area, not less than one-third shall be of the permanently open type.

EXCEPTIONS: Where mechanical ventilation providing equivalent venting of the hoistway is provided in the overhead elevator machine room (see 524 CMR 17.02(8)), required vent area may be reduced subject to the following:

(a) The building is not a hotel, apartment house, hospital, or similar building with overnight sleeping quarters;

(b) The machine room is so located that it has no outside exposure;

(c) The hoistway does not extend to the top story of the building;

(d) The machine room exhaust fan is automatically reactivated by thermostatic means.

18.03: continued

(4) Closed Vents. Closed portions of the required vent area shall consist of windows, skylights, or duct openings glazed with plain glass not more than one-eighth inch thick.

(5) Window and Skylight Frames and Sash. Window and skylight frames and sash shall be of metal.

(6) Skylight Guards. A guard, securely anchored to the supporting structure, consisting of a wire-mesh screen of at least #13 steel wire gauge with openings which will reject a ball one inch in diameter, or an expanded metal screen of equivalent strength and open area, shall be installed above every elevator skylight. A similar screen of at least #18 steel wire gauge, or of expanded metal of equivalent strength and open area, shall be installed below every elevator skylight.

(7) Windows. All windows and window frames in fire-resistive hoistway enclosures shall be fire windows conforming to local laws and ordinances.

(8) Window Guards. Exterior windows in the hoistway less than 100' above the ground or less than 30' above an adjacent roof shall be guarded on the outside by one of the following methods:

(a) By vertical bars not less than five-eighths inches in diameter, or equivalent, spaced not less than ten inches on centers, and not more than ten inches between the window jamb and the center of the nearest bar.

(b) By metal sash having solid-section steel muntins of not less than ⅛" thickness, spaced not more than eight inches apart.

18.04: Hoistway Guards

(1) Counterweight Runways. Counterweight runways of hand elevators located in the elevator hoistway shall be enclosed from a point 12" above the floor of the pit to a point at least seven feet above the floor of its own pit and any other pit adjacent to such counterweight runway.

(2) Rope Enclosures. Where ropes pass through floors on the outside of the shaftway, they shall be enclosed completely from floor to ceiling at all floors with solid enclosures of not less than two hour fire-resistive construction.

18.05: Thoroughfares

If a hoistway does not extend to the lowest floor of a building, and the space under the bottom of the hoistway is used for any purpose, the following conditions shall exist:

(1) The car and counterweight shall be provided with safety devices.

(2) There shall be a structure under the hoistway sufficiently strong to withstand without failure the impact of the car with contract load or the impact of the counterweight under free fall conditions.

18.06: Pipes and Wiring

(1) No pipes, ducts, vessels, electrical conduits or cables shall be located within an elevator shaftway or hoistway or its pit other than those used to furnish or control light, heat, sprinklers, communications or signals for the elevator or hoistway, or for low voltage fire detection systems for the hoistway.

(2) The fixed electrical conductors installed in elevator or counterweight hoistway, machine room and pit shall be encased in rigid metal conduits or electrical metallic tubing.

(3) The traveling electrical conductors connecting the car to the fixed wiring in the hoistway shall have a flame retardant and moisture resistant outer cover.

18.06: continued

(4) Pipes, conduits and armored cables shall be securely fastened to the hoistway construction.

(5) Pressure in steam pipes shall not exceed 15 lbs. above atmospheric pressure.

(6) No pipes, ducts or vessels conveying gases or liquids shall be discharged or vented into the hoistway or shaftway.

(7) All wiring for electricity shall be done in accordance with the best practice. In case any question arises as to what is the best practice, work done according to the requirements of the National Board of Fire Underwriters shall be considered as so done.

18.07: Shaftway Doors: General

(1) All landing openings in hand elevator fire-resistive hoistways shall be provided with doors, panels or fronts of not less than 1½ hour fire-resistive construction. When fire-resistive hoistway enclosures are not required, doors may be of open metal construction which will reject a ball two inches in diameter.

(2) All hoistway doors shall be normally closed when the elevator is not in use.

(3) Hoistway doors shall be equipped to close automatically in case of fire.

(4) Each landing opening shall be provided with a vertical sliding type semi-automatic gate not less than 42" high and meeting the following requirements:
(a) Vertical sliding counterbalanced gates shall be of wood or metal of a design which will reject a two inch ball. Such gates shall be so constructed and guided as to withstand a lateral force of 100 lbs. concentrated at the center of the gate without being deflected past the line of the car sill; and a force of 250 lbs. without forcing the gate from its guides, or without causing it to break and permanently deform.
(b) The bottom of all landing gates shall be not more than two inches above the landing sill.
(c) Gates at landing openings in outside walls shall be not less than six feet high and shall be equipped with a locking device which will prevent the opening of the gate from the outside unless the car is at the landing, and shall be arranged to close and lock automatically when the car leaves the landing.
(d) Gate shoes and guides shall be of metal.
(e) Gate counterweights shall be enclosed or shall run in metal guides from which they cannot be dislodged.
(f) The bottom of all gate weight boxes or of the guides shall be so constructed that the counterweights will be securely held if the counterweight ropes should break.

18.08: Car Construction

(1) Car platforms shall not exceed 6' x 6' in area or a total capacity of 2,000 lbs.

(2) Hand elevators shall have cars enclosed on top and sides not used for entrance. The car enclosure shall be secured to the car platform or frame in such a manner that it cannot work loose or become displaced in ordinary service.

(3) Car frames and platforms shall be of metal or sound seasoned wood designed with a factor of safety of not less than four for metal and six for wood, based on the contract load uniformly distributed. If of wood, the frame members shall be securely bolted and braced.

(4) No glass shall be used in elevator cars except to cover certificates.

18.08: continued

(5) Elevator cars operating in hoistways outside the building, which are enclosed only at the bottom landing, shall be protected on the exposed side or sides by independently operated gates which shall be provided with a lock or latch.

18.09: Capacity and Loading

(1) Contract Load. The contract load of hand elevators shall be not less than 50 lbs. per square foot of net inside car area.

(2) Capacity Plate for Hand Power Elevators. In each hand elevator car, a metal plate shall be provided which shall be fastened in a conspicuous place and shall bear the following information in not less than ¼" letters or figures stamped in, etched, or raised on the surface of the plate:

CAPACITY (X) POUNDS

(The contract load of the elevator in pounds shall be inserted in space (x) above).

18.10: Car Safeties

(1) All hand elevators shall be provided with a safety attached to the underside of the car frame capable of stopping and sustaining the car and contract load.

(2) The application of the safety shall not cause the car platform to become out of level.

(3) Car safeties shall be of the instantaneous type.

(4) Safeties shall be marked by the manufacturer with the range of weight for which they are designed.

(5) A pawl and ratchet or chisel point safety shall not be used.

(6) When the travel exceeds 30', hand power elevator machines having hand operated brakes shall also be equipped with an automatic speed retarder.

18.11: Contract-Load Test of Car Safety Devices

A contract-load test of the car safety devices under the supervision of the authorized inspector shall be made of every new hand elevator before the elevator is placed in regular service. This test shall be made with contract load in car.

18.12: Machines and Machine Safeties

(1) Hand elevators shall be equipped with brakes that operate in either direction of motion of the elevators. When the brake has been applied, it shall remain locked in the "on" position until released by the operator.

(2) Brakes shall be capable of stopping and holding the elevator with contract load.

(3) The factors of safety based on the static loads to be used in the design of all parts of hoisting machines shall be not less than eight for wrought iron or wrought steel and ten for cast iron or other materials.

(4) If suspension stirrups are used for the sheaves or idlers of hand elevators, they shall be of steel.

(5) Adequate means of access shall be provided to sheaves and machines for maintenance and inspection.

18.12: continued

(6) No hand elevator machine shall be equipped with any means or attachment for applying any other power unless such elevator is permanently and completely converted into a power elevator complying with the requirements of the code for power elevators.

18.13: Suspension Means

(1) Suspension members shall be wire ropes or chains.

(2) A durable plate shall be placed upon the crosshead, bearing the following information in not less than ¼" letters or figures stamped, etched, or raised on the surface of the plate:

(a) The rope suspension date.

(b) Number, diameter, material, and rated ultimate strength of the suspension means used, as follows:

FIGURE 1.

SUSPENSION SPECIFICATIONS

Suspension Material	Material	Nominal-Size	Rated Ultimate Strength in Lbs.
Hoisting			
Counterweight			

(3) In addition, a durable tag shall be attached to the suspension fastenings, stating the size, rated ultimate strength and material of the suspension, and the date of its installation.

(4) The factor of safety used in determining the size of the suspension member shall be five, based on the weight of the car and its contract load.

(5) Suspension members shall be so adjusted that, when the car or counterweight of a hand elevator rests on its buffers or supports, there shall be a minimum clearance of 12" above the counterweight or car, respectively.

(6) No bottom runby is required for hand elevators.

(7) Suspension members secured to a winding drum shall have not less than one complete turn of the suspension member around the winding drum when the car or counterweight has reached the extreme limit of its overtravel.

(8) The drum end of suspension members shall be secured by clamps or sockets inside the drum.

(9) Not less than two suspension members shall be provided for each car and each counterweight.

18.14: Guide Rails

Car and counterweight guide rails shall be of steel or straight-grained, seasoned wood free from knots, shakes, dry rot or other imperfections. Guide rails shall be securely fastened with through bolts, screws or clips of such strength, design and spacing that the guide rails and their fastenings shall not deflect more than ¼" under normal operation, particularly where in contact with the guide shoe when the car is at the landing. Guide rails shall withstand the application of the safety when stopping a fully loaded car or the counterweight. The guiding surfaces of the guide rails for elevators requiring safeties shall be finished smooth. The guide rails shall be "bottomed" on suitable supports and extended at the top to prevent guide shoes running off in case the overtravel is extended.

18.15: Counterweights

(1) Counterweights shall run in guides, or be fully enclosed in a counterweight box.

(2) Sections of counterweights, whether carried in frames or not, shall be secured by at least two tie rods passing through holes in the sections. The tie rods shall have lock nuts secured by cotter pins at each end.

REGULATORY AUTHORITY

524 CMR 18.00: M.G.L. c. 143, § 69.

NON-TEXT PAGE

524 CMR 19.00: DUMB-WAITERS

Section

19.01: Hoistway Enclosures
19.02: Machine Sheave Enclosures
19.03: Venting of Hoistways
19.04: Thoroughfares
19.05: Pipes and Wiring
19.06: Dumb-waiter Hoistway Doors
19.07: Car Construction
19.08: Hydraulic Driving Machines
19.09: Power Dumb-waiter Machines
19.10: Terminal Stopping and Machine and Safety Devices
19.11: Suspension Means

19.01: Hoistway Enclosures

(1) The hoistways of all dumb-waiters shall be enclosed throughout their height.

(2) Where the dumb-waiter hoistway penetrates any fully enclosed solid floor above the bottom landing, the walls shall be of not less than two-hour fire-resistive rating.

All plans for electric dumbwaiter installations shall be signed by a registered professional engineer or a registered architect and shall bear his registering stamp certifying that he has examined the plans and finds that the hoistway structure will comply with the contract load plus its tare. The complete dumb-waiter installation shall comply with the Massachusetts elevator code now in effect.

(3) Where the dumbwaiter either serves only open construction floors or serves only open balcony floors within one story, the walls shall be of non-combustible materials of either solid construction or open metal construction which will reject a two inch ball, provided such open construction fronts or panels are not less than two inches from any moving equipment within the enclosure. Where less than two inches from moving equipment, open construction shall reject a ½ ball.

(4) Where a hoistway extends into the top story of a building, fire-resistive hoistway or machinery enclosures, where required, shall be carried to the underside of the roof if the roof is of fire-resistive construction, and at least three feet above the top surface of the roof if the roof is of non-fire-resistive construction.

(5) Where hoistway enclosures are not required to continue through the roof, the top of the shaftway shall be of fire-resistive construction equivalent to that required for the walls.

(6) More than one dumb-waiter may be installed in the same shaftway.

(7) Emergency stop switches shall be installed in all dumbwaiter pits.

(8) Electric contacts shall be installed on all machine access doors and access panels on all dumbwaiters.

19.02: Machine Sheave Enclosures

(1) Dumb-waiter machines or sheaves shall be enclosed.

(2) Where fire-resistive hoistway enclosures are required, machine room enclosures shall be of solid construction and of not less than two-hour fire-resistive construction. Where fire-resistive hoistway enclosures are not required, machine room enclosures shall be of non-combustible material, either solid or openwork which shall reject a two inch ball.

(3) Enclosures shall be located:
  (a) Above the top of the hoistway;
  (b) Below the hoistway;

19.02: continued

(c) Adjacent to and on any side of the hoistway;
(d) Within the hoistway itself, in which instance the hoistway may serve as the enclosure.

(4) Dumb-waiter support beams shall be of steel, designed with a factor of safety of not less than five.

(5) Flooring or floor covering within enclosures, where provided, shall be of materials other than wood.

(6) Doors to machine or sheave enclosures shall be of not less than 1½ hour fire-resistive construction and shall be equipped with locks. Swing type doors shall be self-closing.

(7) Loads on overhead beams and their supports shall be computed as follows: The total load on overhead beams shall be equal to the weight of all apparatus resting on the beams plus twice the maximum static load suspended from the beams.

19.03: Venting of Hoistways

(1) General. Hoistways of dumb-waiters serving more than three stories shall be provided with means for venting smoke and hot gases to the outer air in case of fire.

Exception: Hoistways not extending into the top story of a building, other than hotels, apartment houses, hospitals, and similar buildings with overnight sleeping quarters, where the hoistways are equipped with approved automatic sprinklers connected to the building water-supply system or to an approved automatic sprinkler system. (In case any question arises as to what is the best practice, work done in accordance with the requirements of NBFU Standards No. 13, entitled "Sprinkler Systems," dated June, 1953, will be considered as compliance.)

(2) Location of Vents. Vents shall be located:
(a) In the side of the hoistway enclosure directly below the floor or floors at the top of the hoistway, and shall open directly to the outer air or through noncombustible ducts to the outer air; or,
(b) In the wall or roof of the penthouse or overhead machinery space above the roof, provided that openings of at least equivalent area are provided in the floor or floors at the top of the hoistway.

(3) Area of Vents. The area of the vents shall be not less than 3½% of the area of the hoistway nor less than ½ square foot of each dumb-waiter car, whichever is greater. Of the total vent area described, not less than one-third shall be of the permanently open type.

Exceptions: Where mechanical ventilation providing equivalent venting of the hoistway is provided in the overhead elevator machine room (see 524 CMR 17.02(8)), required vent area may be reduced subject to the following:
(a) The building is not a hotel, apartment house, hospital, or similar building with overnight sleeping quarters;
(b) The machine room is so located that it has no outside exposure;
(c) The hoistway does not extend to the top story of the building;
(d) The machine room exhaust fan is automatically reactivated by thermostatic means.

(4) Closed Vents. Closed portions of the required vent area shall consist of windows, skylights, or duct openings glazed with plain glass not more than ⅛" thick.

(5) Window and Skylight Frames and Sash. Window and skylight frames and sash shall be of metal.

19.03: continued

(6) Skylight Guards. A guard, securely anchored to the supporting structure, consisting of a wire-mesh screen of at least #13 steel wire gauge with openings which will reject a ball one inch in diameter, or an expanded metal screen of equivalent strength and open area, shall be installed above every dumb-waiter skylight. A similar screen of at least #18 steel wire gauge, or of expanded metal of equivalent strength and open area, shall be installed below every dumb-waiter skylight.

(7) Windows are permitted only in external walls of hoistway enclosures.

(8) All windows and window frames in fire-resistive hoistway enclosures shall be fire windows conforming to local laws and ordinances.

(9) Exterior windows in the hoistway less than 100' above the ground or less than 30' above an adjacent roof shall be guarded on the outside by one of the following methods:

(a) By vertical bars not less than ⅝" in diameter, or equivalent, spaced not less than ten inches on centers, and not more than ten inches between the window jamb and the center of the nearest bar.

(b) By metal sash having solid-section steel muntins of not less than ⅛" thickness, spaced not more than eight inches apart.

19.04: Thoroughfares

If the hoistway of a dumb-waiter does not extend to the lowest floor of a building and the space under the bottom of the car or counterweight is used for any purpose, the following requirements shall be met:

(a) The car and its counterweight shall be provided with a safety device of the instantaneous type, designed and installed to apply and stop the fully loaded car and counterweight without appreciable delay on the breaking of the suspension means, irrespective of the location of the break.

(b) The construction of the hoistway under the car and counterweight shall be sufficiently strong to withstand, without failure the impact of the fully loaded car and of the counterweight descending at 125% of contract speed.

(c) Where calculations, based on good engineering practice demonstrate that the structure under the hoistway is capable of withstanding, without failure, the impact of the fully loaded car or its counterweight, falling freely from their upper limits of travel, no safety device shall be required for the car or counterweight.

19.05: Pipes and Wiring

(1) No electrical conduits or cables or any other installation other than those used to furnish or control power, light, heat or signals for the dumb-waiter or hoistway shall, in any way, be located within the hoistway.

(2) Pipes, conduits and armored cables shall be securely fastened in the hoistway construction.

(3) Pressure in steam pipes shall not exceed 15 lbs. above atmospheric pressure.

(4) No part of any electric circuit having a rated system or circuit voltage in excess of 250 volts shall be used either for any operating circuit or for any control circuit on any equipment which is located in the hoistway, on the car, on the landing doors, or at the landing openings.

(5) All wiring for electricity shall be done in accordance with the best practice. In case any question arises as to what is the best practice, work done according to the requirements of the Massachusetts Electrical Code shall be considered as so done.

19.06: Dumb-waiter Hoistway Doors

(1) All landing openings in dumb-waiter fire-resistive shaftways shall be provided with doors, panels or fronts of not less than 1½ hour fire-resistive construction. Where fire-resistive hoistway enclosures are not required, doors may be of open metal construction which will reject a ball two inches in diameter.

(2) The landing door opening shall not exceed the width and height of the car and in no case shall the height exceed four feet provided that one landing door may be of a larger size to permit installing or removing the car.

(3) Hoistway landing doors of power driven dumb-waiters, other than where hoistway type interlocks are used, shall be of the vertical sliding type and shall be provided with hoistway unit-system type contacts and mechanical locks which are arranged so that the car cannot be operated unless each hoistway landing door is in the closed position.

(4) Mechanical locks, where used, shall be of a double hook or multiple hook type arranged to lock the door after the car departs from the landing zone.

(5) Landing doors in shaftways for hand-powered dumb-waiters shall be of the self-closing type, or shall be equipped to close automatically in case of fire.

19.07: Car Construction

(1) Dumb-waiter cars shall be of rigid construction and designed to sustain the contract load.

(2) Cars shall be made of wood or metal.

(3) Cars for power dumb-waiters shall be reinforced with metal from the bottom of the car to the point of suspension.

(4) Metal cars shall be of metal sections rigidly riveted, welded or bolted together.

(5) Cars may be provided with hinged or removable shelves.

(6) Dumb-waiter cars shall be capable of sustaining the loads given in Table 1 in 524 CMR 19.07 with factors of safety not less than six for steel and nine for cast iron or other materials. The motive power need not be sufficient to raise the structural-capacity load.

TABLE 1.

Effective Platform Area (Sq. ft.)	Minimum Design Capacity (lbs.)
4	100
5	150
6.25	300
9	500

(7) A metal capacity plate shall be provided which shall be fastened in a conspicuous place and shall bear the following information in not less than ¼" letters or figures, stamped, etched, or raised on the surface of the plate:

FIGURE 1.

CONTRACT LOAD ____________ POUNDS

19.08: Hydraulic Driving Machines

Hydraulic driving machines shall be of the direct plunger type and shall conform to 524 CMR 17.23(1).

19.09: Power Dumb-waiter Machines

(1) Dumb-waiter machines shall be securely fastened to their supports. The factors of safety, based upon the ultimate strength of the materials and the contract load, plus the weight of the car, ropes, counterweights, to be used in the design of dumb-waiter machines shall be not less than six for steel, and nine for cast iron or other materials.

(2) Sheaves or idlers shall not be suspended in cast iron stirrups from the under side of the supporting beam.

(3) Belts and chains may be used as the driving means between motors and driving sheaves or drums of power dumb-waiters subject only to the following restrictions:
(a) When flat belts are used, the contract speed shall not exceed 50 F.P.M.
(b) Where multiple "V" belts are used, the contract speed shall not exceed 150 F.P.M.

19.10: Terminal Stopping and Machine Safety Devices

(1) Power dumb-waiters shall be provided at each terminal with means independent of manual operation to stop the car automatically within the limits of overtravel.

(2) Power dumb-waiters, other than hydraulic dumb-waiters, shall be equipped with brakes which are automatically applied when the power is cut off the motor.

(3) Power dumb-waiters operated by winding-drum machines shall be provided with a slack-rope device.

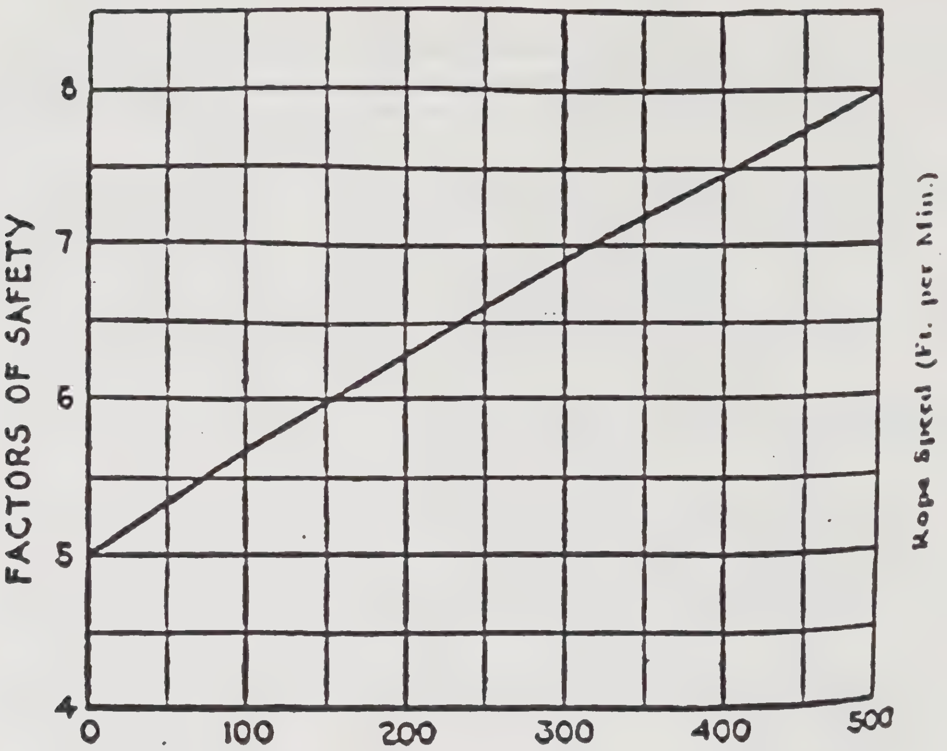
19.11: Suspension Means

(1) Power dumb-waiters other than those of the direct plunger type shall be provided with one or more iron or steel hoisting ropes or chains. No covering shall be permitted on ropes other than where liability to excessive corrosion or other hazards exists, in which case Marline covering may be used. Chains, when used, shall be of the roller or block type.

(2) Steel wire hoisting ropes or chains secured to the car or counterweight or rope hitch shall be babbitted sockets or rope clamps.

(3) The factor of safety for car and counterweight ropes based on static loads and ultimate strength of the rope shall be not less than the values given in Figure 1 in 524 CMR 19.11 below, corresponding to the contract speed of the car. For chains the factor of safety shall be not less than 25% greater than given in Figure 1 in 524 CMR 19.11.

FIGURE 1.
Factors of Safety for Hoisting Ropes for Dumb-waiters



REGULATORY AUTHORITY

524 CMR 19.00: M.G.L. c. 143, § 69.

524 CMR 20.00: SIDEWALK ELEVATORS AND MANLIFTS

Section

20.00 Sidewalk Elevators and Manlifts

20.00: Sidewalk Elevators and Manlifts

The new installation of sidewalk elevators and manlifts is prohibited.

REGULATORY AUTHORITY

524 CMR 20.00 M.G.L. c. 143, § 69.

NON-TEXT PAGE

524 CMR 21.00: OPERATION OF ELEVATORS

Section

21.01: Licensed Operators: General
21.02: Granting of Licenses
21.03: Display of Licenses
21.04: Revocation and Suspension of Licenses
21.05: Instructions to Operators

21.01: Licensed Operators: General

No person shall operate, and no owner, lessee, employer or his agent shall cause or permit to be operated, any elevator except by a person duly licensed for such service by the Commissioner of Public Safety, except:

(1) In case of emergency, such operation by a competent unlicensed person may be permitted for a period not exceeding two consecutive days, provided the Department of Public Safety is immediately notified. Such periods may be extended by the department where necessary to avoid undue hardship, but no single extension shall exceed a period of more than seven consecutive days.

(2) Licensed operators are not required for automatic operation or continuous pressure operation passenger or freight elevators or existing shipper rope elevators, when equipped with the proper safeguards. Where an operator has been designated to be in permanent charge of such elevators or where a car switch is employed, said operator shall be licensed.

(3) An operator's license shall not be required of an elevator contractor or of a qualified mechanic engaged in the construction, maintenance, or repair of elevators or elevator hoistways, or of an inspector having authority to inspect elevators.

21.02: Granting of Licenses

(1) Whoever desires to act as an operator of elevators herein required to be operated by a licensed person shall make application to the department on blanks to be furnished by the said department. A license shall not be granted to a person less than 18 years of age.

(2) The applicant shall be given a practical examination as to his knowledge of the operation of elevators, particularly as to the safeguarding of passengers and the requirements of 524 CMR 21.00 and if found competent shall be granted a license by the Commissioner.

(3) Licenses shall be issued until the date of birth of the licensee occurring more than 12 months but not more than 24 months after the effective date of such license. If any such license or the renewal thereof expires in an even year, any subsequent renewal shall expire on the next anniversary of the licensee's date of birth occurring in an even year. If any such license or renewal thereof expires in an odd year, any subsequent renewal shall expire on the next anniversary of the licensee's date of birth occurring in an odd year. A license issued to a person born on February 29 shall, for the purposes of 524 CMR 21.02(3), expire on March first.

(4) Should a license become lost, a duplicate thereof shall be granted upon application to the department.

(5) The fee for a new license shall be $1.50; the fee for the renewal of a license shall be $1.00. The fee for a duplicate license shall be .50.

21.03: Display of Licenses

A licensed operator shall at all times when operating an elevator be prepared to display his license on demand of the owner or tenant of the building, or of any person authorized to inspect the elevator, or of any police officer.

21.04: Revocation and Suspension of Licenses

(1) A wilful falsification in the matter of a statement in an application shall be deemed sufficient cause for the revocation at any time of a license granted on said application.

(2) A license may be suspended or revoked by the Commissioner, if the holder is incompetent or untrustworthy or fails to comply with 524 CMR 21.04.

21.05: Instructions to Operators

Learn These Instructions Thoroughly and Keep A Copy Available For Use At All Times.

(1) Always open the service switch or lock the operating mechanism when placing the elevator out of service.

(2) Be sure the operating mechanism is in the "STOP" position before closing the service switch.

(3) Report any defects promptly to the person in charge.

(4) Do not attempt to make any repairs.

(5) Carry no passengers or freight while inspections, repairs, or adjustments are in progress, and operate the car only in response to directions from the inspector or person in charge. Do not move the car when anyone is in the pit or on top of the car except as he may direct.

(6) When in the opinion of the operator an excess load is to be carried, do not ride or allow others to ride on the elevator.

(7) Hoistway doors or gates shall always be closed and locked before the car is started. The car shall be brought to a stop at the landing level before either the car door or car gate where provided or the hoistway door or hoistway gate is opened manually.

(8) Keep car gates closed while car is running, and where no car gates are provided, keep passengers away from the open edge of the car platform.

(9) Limit the number of passengers or load to the contract capacity of the car and do not permit crowding or overloading.

(10) Do not reverse the operating device suddenly; stop the car before reversing.

(11) Move operating device to the stop position on approaching the terminal landings. Do not depend on the terminal stops in the ordinary operation of the car.

(12) Should the power go off while the car is in motion, move the operating device to the "STOP" position and start the car in the usual manner upon return of the power.

(13) Familiarize yourself with the emergency devices, understand their function, and know how to operate them.

(14) Should the car stop suddenly, shut off the power, call for the person in charge and operate the elevator only at his direction. While waiting, keep calm. Do not attempt to release any safety device; remember that it is safer to stay in the car until help arrives than to try to get out, and so instruct your passengers.

(15) Should the car refuse to stop, do not attempt to jump off.

(16) Before loading or unloading elevators with hand-rope type operation, lock the operating mechanism in the "STOP" position.

21.05: continued

(17) Never leave the car in the ordinary course of operation nor leave the operating mechanism unprotected. When going off duty for any reason, even for a few minutes, be sure that the power is disconnected or that the operating mechanism is locked and the hoistway doors are closed.

(18) Always leave a hydraulic elevator operated by a lever at the lower landing with the lever in the position for down motion.

(19) In running a belt-driven elevator, be sure to pull the hand-rope as far as possible when starting the car. In doing so, you throw the belt full on the tight pulley, and thus prevent if from slipping. In stopping, use the centering rope.

(20) Never allow anyone to scuffle or fool on the elevator. It is always dangerous.

(21) Never, under any condition, allow anyone to get on or off the car while it is in motion.

(22) Keep your mind on your work. Always remain at your post while the car is moving, so that you can stop it quickly in an emergency.

(23) If an accident causing material damage or injury to a person by an elevator, escalator, dumb-waiter, or other devices governed by 524 CMR 21.05, requires medical attention, the person having knowledge of the accident, be he the owner, lessee, operator, or other person in charge, shall immediately report such accident to the inspector having jurisdiction, who shall forthwith inspect such elevator or devices herein described. Said inspector shall file a complete written report of his inspection with the Commissioner of Public Safety.

REGULATORY AUTHORITY

524 CMR 21.00: M.G.L. c. 143, § 69.

NON-TEXT PAGE

524 CMR 22.00: MOVING STAIRWAYS

Section

22.01: Construction: Protection of Floor Openings
22.02: Angle of Inclination
22.03: Width
22.04: Balustrading and Hand Rails
22.05: Step Frames and Treads
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22.01: Construction: Protection of Floor Openings

(1) Floor openings for moving stairways not constituting required means of egress shall be protected as follows:

(2) Floor openings shall be provided with enclosures as required for stairways

OR

(3) In buildings completely protected by an approved automatic sprinkler system, each moving stairway floor opening shall be protected against the passage of fire, smoke and gases to the story above by one of the following alternative methods of protection: Sprinkler-Vent method (524 CMR 22.01(4)); Rolling Shutter method 524 CMR 22.01(5)); or Spray Nozzle method (524 CMR 22.01(6)); and, in addition to the manual controls specified, each moving stairway shall be provided with an automatic stopping device which will stop the unit when any one of the protective methods specified functions.

(4) Sprinkler-Vent method -- a combination of an automatic water curtain meeting the following requirements:

(a) The exhaust system shall be of such capacity as to create a downdraft, through the moving stairway floor opening, having an average velocity of not less than 300 feet per minute under normal conditions for a period of not less than 30 minutes.

Note: This requirement can be met by the provision of an air intake from the outside of the building above the floor opening. The test of the system under "normal" conditions requires that the velocity of the downdraft be developed when windows or doors normally used for ventilation are open. The size of the exhaust fan and exhaust ducts must be sufficient to meet such ventilation conditions. Experience indicates that fan capacity should be based on a rating of not less than 500 cfm per square foot of moving stairway opening to obtain the 300 ft./min. required. If the building is provided with an air-conditioning system arranged to be automatically shut down in the event of fire, the test conditions should be met with the air-conditioning system shut down. The 300 ft./min downdraft through the opening provides for the testing of the exhaust system without requiring an expansion of air present under actual fire conditions.

(b) Operation of the exhaust system for any floor opening shall be initiated by an approved thermostatic device in the story involved and shall also result from the functioning of other required automatic fire detection devices within the building or section of the building. There shall also be provided a manual means of operating and testing the system.

Note: Supervised smoke detection devices ordinarily provide earlier detection of fire than automatic sprinkler systems and if used to actuate the exhaust system automatically should provide an added life-safety advantage.

(c) To assure reliability of the electrical supply to all parts of the exhaust system and control devices, the circuits shall be supplied directly from the bus bars of the main switchboard, or by a main connected to the bus bars of the main switchboard but not used for any other purpose.

22.01: continued

(d) Fans and ducts used in connection with automatic exhaust systems shall be constructed and installed in accordance with the best engineering practice.
(e) Periodic tests, not less frequently than quarterly, shall be made of the automatic exhaust system to maintain the system and the various control devices in good working order.
(f) The water curtain shall be formed by open sprinklers or spray nozzles so located as to form a complete water barrier along all exposed sides of the door opening and reaching from the ceiling to the floor.

(5) Rolling Shutter method -- an automatic self-closing rolling shutter which will completely enclose the top of each moving stairway opening above the street floor, meeting the following requirements:
(a) The shutter shall close off the wellway opening immediately upon the automatic detection, by an approved device, of either fire or smoke in the vicinity of the moving stairway, and in addition there shall be provided a manual means of operating and testing the operation of the shutter.
(b) The shutter assembly shall be capable of supporting a weight of 100 lbs. on any one square foot of area, and not less resistant to fire or heat than 24 gage steel.
(c) The shutter shall operate at a speed of not greater than 30' per minute and shall be equipped with a sensitive leading edge. The leading edge shall arrest the progress of the moving shutter and cause it to retract a distance of approximately six inches upon the application of a force not in excess of 20 lbs. applied on the surface of the leading edge. The shutter, following retraction, shall continue to closure immediately.
(d) To assure reliability of the electrical supply to the control devices for, and for actuation of, the automatic rolling shutter, the circuits shall be supplied directly from the bus bars of the main switchboard, or by a main connected to the bus bars of the main switchboard but not used for any other purpose.

(6) Spray Nozzle method -- a combination of an automatic smoke or fire detection system and a system of high velocity water spray nozzles, meeting the following requirements:
(a) Spray nozzles shall be of the open type and shall have a solid conical spray pattern. The number of nozzles, discharge angles and location shall be such that the moving stairway floor opening will be completely covered by a dense spray upon the operation of the system.
(b) The number and size of nozzles and water supply shall be sufficient to deliver a discharge of 2½ gallons of water per square foot per minute through the floor opening.
(c) Spray nozzles shall be located near the top of the wellway housing and so positioned that the center line of discharge is at an angle not less than 60° with the plane of the opening to be protected.
(d) Spray nozzles shall be provided with a water supply, separate from the water supply system for automatic sprinklers, at a minimum flowing pressure of at least 25 lbs. per square inch. Oversize piping shall be used to minimize friction loss.
(e) Control valves shall be readily accessible to minimize water damage. Thermal control valves may be used, if piping is arranged and sized so that any one control valve can supply simultaneously all the spray nozzles intended for the protection of the moving stairway floor opening.
(f) A noncombustible draft curtain, extending 20" to 30" below and around the opening and a solid non-combustible wellway housing above the floor shall be provided at each moving stairway floor opening. Spray nozzles shall be protected by sheet metal deflectors against mechanical injury.
(g) Means of manual operation of the spray nozzle system for any floor opening shall be provided, and the system shall also be actuated by approved smoke detection or thermostatic devices in the story in which fire may occur. Supervised smoke detection devices located in or near the moving stairway floor opening may be used to meet this requirement. Thermostatic fire detection devices, such as rate-of-rise or fixed temperature systems, used to initiate the operation of the spray nozzle system shall be so located as to assure the operation of the system in advance of the passage of smoke through the moving stairway floor opening.

22.02: Angle of Inclination

The angle of inclination of a moving stairway shall not exceed 30° from the horizontal.

22.03: Width

The width between moving stairway balustrade shall be not less than 22 inches nor more than 48", measured on the incline at a height of 27" vertically above the nose line of the steps. In no case shall such width exceed the width of the steps by more than 13".

22.04: Balustrading and Hand Rails

(1) Moving stairways shall be provided on each side with solid balustrading. On the step side, the balustrading shall be smooth, without depressed or raised paneling or molding. Necessary protective molding parallel to the run of the steps and vertical molding not more than ¼" and properly beveled may be used to cover joints of panels.

(2) Where glass panels are used in balustrading, they shall be of laminated type glass.

(3) The clearance between the step treads and the balustrading curtain guard shall not exceed ⅛".

(4) There shall be no abrupt change in the width between the balustrades. Any change shall be not more than eight percent of the greatest width. In changing from the greater to the smaller width, the change in the direction of the balustrading shall be not more than 15° from the line of travel.

(5) Each balustrading shall be equipped with a moving handrail travelling at substantially the same speed and in the same direction as the travel of the steps. Each moving handrail shall extend at normal handrail height not less than 12" beyond the line of the comb-plate teeth at the upper and lower landing.

(6) Hand or finger guards shall be provided at the point where the handrail enters the balustrading.

(7) Where the intersection of the outside balustrade or deck board and the ceiling or soffit is within 24" of the centerline of the handrail, a vertical guard plate of solid construction shall be installed in the apex of the intersecting angle. The vertical face of the guard shall project at least 14" measured horizontally from the apex of the angle. Where glass plates are used, they shall be of shatterproof glass. Vertical end of the guard plate shall be rounded to eliminate a shear hazard.

22.05: Step Frames and Treads

(1) Step frames and treads shall be of noncombustible material. Step treads shall be horizontal and of a material and design affording a secure foothold.

(2) The depth of any step tread in the direction of travel shall not be less than 15¾", and the rise between treads shall not exceed 8½". In no case shall the width of a step tread be less than 16".

(3) The maximum clearance between treads on the horizontal run shall be ⅛".

(4) The tread surface of each step shall be slotted in a direction parallel to the travel of the steps. Each slot shall be not more than ¼" wide and not less than ⅜" deep, and the distance from center to center of adjoining slots shall be not more than ⅜".

(5) There shall be a comb-plate at the entrance and exit of every moving stairway. The comb-plate teeth shall be meshed with and set into the slots in the surface of the tread, so that the points of the comb teeth are always below the top surface of the treads.

22.05: continued

(6) Comb-plates shall be adjustable in both the horizontal and vertical directions.

(7) Sections forming the comb-plate teeth shall be so arranged as to be readily replaceable.

22.06: Design of Trusses or Girders

The truss or girder shall be so designed that it will safely sustain the steps and running gear in case of failure of the track system to retain the running gear in its guides.

22.07: Track Arrangement

The track arrangement shall be designed to prevent displacement of the steps and running gear if a step chain breaks.

22.08: Capacity and Loading

qThe contract load, in pounds, shall be computed by the following formula:

$$\text{Contract load} = 4.6\ W\ A$$

In this formula, W is the width in inches between the moving stairway balustrades measured 30" vertically above the nose line of the steps, and A the horizontally projected distance in feet between the upper and lower comb-plate teeth.

22.09: Factors of Safety

The factors of safety to be used in the design of moving stairways shall be at least the following, based on the static loads:

(1) For trusses and all structural members, including tracks, five.

(2) For moving stairway driving machines -- for wrought iron or wrought steel, eight; for cast iron, cast steel, or other materials, ten.

(3) For power transmission members, ten, other than step chains composed of cast steel links which shall be thoroughly annealed, in which case the factor of safety shall be not less than 20.

22.10: Safety Requirements

(1) Limits of Speed. The rate of travel of the steps measured along the angle of inclination shall not exceed 125 feet per minute.

(2) Application of Power.
(a) Each moving stairway shall be driven by an individual motor.
(b) The driving machine shall be connected to the main drive shaft by tooth gearing, a coupling, or chain.
(c) Where a means other than a solid shaft, coupling, or tooth gearing connects the motor to the gear reducer, the electrically released, mechanically applied brake must be located on the gear reducer or main drive shaft.
(d) If the drive motor is attached to a gear reducer by means other than a solid shaft, coupling or tooth gearing, a device shall be provided that will cause the application of the electrically released, mechanically applied brake if the motor becomes disconnected from the gear reducer or if escalator overspeeds or underspeeds.

22.10: continued

(3) Safety Devices. The following safety devices shall be provided:

(a) An emergency stop button, accessible to the public and not enclosed, shall be conspicuously located at both the top landing and bottom landing of each moving stairway not more than five feet above the landing level. The operation of either one of these buttons shall be arranged to cause the interruption of power to the moving stairway. It shall be impossible to start a moving stairway by means of these buttons. Each of these buttons shall be marked "EMERGENCY STOP BUTTONS."

(b) Starting buttons or switches shall be located within sight of the moving stairway and shall be of the key-operated type.

(c) Each moving stairway shall be provided with a speed governor which will cause the interruption of power to the moving stairway in case the speed exceeds a pre-determined value which shall be not more than 40% in excess of the normal running speed. The speed governor is not required where an alternating current squirrel cage induction motor is used.

(d) Each moving stairway shall be provided with a broken step switch and broken chain switch which will cause interruption of power to the moving stair and shall be of the manual reset type. Where no automatic chain tension device is provided, this device shall also function in case excessive sag occurs in either step chain.

(e) Where a moving stairway is equipped with tightening devices operated by means of tension weights, provision shall be made to retain these weights in the moving stairway-truss or frame in case the weights should fail.

(f) Each moving stairway shall be provided with an electrically released, mechanically applied brake of sufficient power to stop it when fully loaded.

This brake shall automatically stop the moving stairway when operating or tending to operate in the descending direction in case any of the safety devices function.

(g) Where the drive machine is connected to the main drive-shaft by a chain, a device shall be provided which will cause the application of a brake on the main drive-shaft in case the drive chain parts.

(h) Skirt Obstruction Device. Wherever the basic design of the panels will permit its addition, means shall be provided to cause the opening of the power circuit to the moving stair driving machine motor and brake, should an object become wedged between the step and the skirt panel as the step approaches the upper and lower combplates.

(i) Upthrust track switches shall be provided and shall be of the manual reset type.

(j) Handrail brush switches shall be installed.

(4) Lights and Access.

(a) There shall be an electric light (ten candlepower) and a 110 volt outlet in every moving stairway machine room and pit access area which can be lit without passing over or reaching over any part of the machinery.

(b) Free access to the moving stairway, machine room, pit access areas and inspection doors shall be provided for inspection and maintenance and shall be electrically contacted.

22.11: Tests

Each type of moving stairway shall be type-tested for the contract load for which it is designed to carry. Such tests may be made at the option of the manufacturer in his plant or on the first moving stairway of that type installed in a building. In case the first installation of a given type is not of sufficient rise and/or width to permit testing it for the maximum rated load of the type, subsequent type-tests shall be made with load until a maximum load test has been made.

(1) Speed Test. The application of the over speed safety device shall be obtained by causing the moving stairway to travel at governor tripping speed.

(2) Broken Step Chain. The broken step chain device shall be tested by operating the actuating device by hand.

22.11: continued

(3) Broken Drive Chain. The broken drive chain device, where a drive chain is provided, shall be tested by operating the actuating device by hand.

(4) Stop Buttons. The emergency stop buttons shall be tested by operating these buttons when the moving stairway is operated in each direction of travel.

(5) Stop Switches in Machinery Spaces. A stop switch shall be provided in each machinery space where means of access to the space is provided. The switch, when open, shall cause the electric power to be removed from the moving stairway driving machine motor and brake. The stop switch shall:
(a) be of the manually opened type
(b) be conspicuously and permanently marked "STOP"
(c) be positively opened mechanically and the opening shall not be solely dependent on springs.

(6) Reverse Phase Relays. Each power driven moving stairway driven by a polyphase alternating current motor shall be provided with a device which will prevent starting the motor if:
(a) the phase rotation is in the wrong direction, OR
(b) if there is a failure in any phase.
Note: 524 CMR 22.00 does not apply to AC motors used to drive motor generator sets.

(7) Disconnect Means. An enclosed fused disconnect switch or circuit breaker arranged to disconnect the power supply to the moving stairway shall be installed in the space where the controller is located or shall be mounted on the controller. Disconnect switches or circuit breakers shall be of the manually closed multi-voltage type.

REGULATORY AUTHORITY

524 CMR 22.00: M.G.L. c. 143, § 69.

524 CMR 23.00: PRIVATE RESIDENCE ELEVATOR CODE

Section

23.01: Scope
23.02: Hoistways
23.03: Hoistway Guards
23.04: Landings
23.05: Counterweights
23.06: Safeties
23.07: Machines
23.08: Suspension Means
23.09: Emergency Signal

23.01: Scope

The rules in 524 CMR 23.00 apply only to power passenger elevators serving only a single family, installed in a single residential building and having a contract load not in excess of 700 lbs. the contract speed not in excess of 50 fpm and a clear platform area not in excess of 12 sq. ft. and a rise not in excess of 50'. All regulations shall comply with local laws and ordinances.

For requirements governing hand-elevators, refer to the appropriate sections of 524 CMR 15.00 through 33.00.

23.02: Hoistways

(1) Enclosure. The hoistway shall be solidly enclosed and be of one hour fire-rated construction throughout.

(2) Contract Speed.
(a) If the contract speed is 30 fpm or less, the enclosure may be omitted in the lowest story served if there is no pit and if the car platform is equipped with a device which, when obstructed in its downward travel by a force not to exceed 4 lbs. applied anywhere at its lower surface, will open an electric contact in the control circuit and thus stop down travel of the car within the range of the free suspension of the device and not exceeding three inches.
(b) If the contract speed is 30 fpm or less, the hoistway landing door or doors at the lower landing may be omitted on elevators located in existing open stairway areas or other existing open areas if the car platform is equipped with a device which will meet the requirements of 524 CMR 23.02(2)(a), and stop the car when it is obstructed in its downward travel, and provided that the unused sides of the hoistway are protected.

(3) Car Clearances.
(a) There shall be a clearance of not less than ¾" between the car and the hoistway enclosure and between the car and its counterweight.
(b) The clearance between the car platform and the landing threshold shall be not less than ½" nor more than one inch.

(4) Pits and Overtravel.
(a) The structure at bottom of hoistway shall be sufficiently strong to withstand without failure the impact of the car with contract load, also the impact of the counterweight, when either is descending at contract speed, or at governor tripping speed if governor-operated safety is used. (See 524 CMR 17.16.)
(b) A pit is not required at the bottom of the hoistway and the car may stop immediately on or above the bottom landing floor, or a pit may be provided to permit the car floor to stop flush with the landing floor, if equipped with a device that will meet the requirements of 524 CMR 23.02(2).
(c) A pit shall not be provided when there is no hoistway enclosure at the lowest story served.

23.02: continued

(d) At the top landing, there shall be a top clearance of not less than four inches plus one inch for each 3⅓ fpm speed in excess of 30 fpm.

(5) Overhead Support.

(a) All machinery and sheaves shall be so supported and secured as effectually to prevent any part becoming loose or displaced.

The supporting beams shall be steel, sound timber or reinforced concrete.

(b) Loads on overhead beams and their supports shall be computed as follows: The total load on overhead beams shall be assumed as equal to the weight of all apparatus resting on the beams plus twice the maximum load suspended from the beams. The load resting on the beams shall include the complete weights of machine sheaves, controller, etc. The load suspended from the beams shall include the sum of the tensions of all ropes suspended from the beams.

Note: The object in doubling the suspended load is to allow for impact, acceleration stresses, etc.

(c) No elevator machinery or sheaves shall be fastened to the underside of the supporting beams at the top of the hoistway.

Other Than: The idler or deflecting sheaves with their guards and frames.

Supporting members for sheaves and other elevator machinery hung underneath beams shall not depend solely on cast iron in tension.

(d) The factor of safety for overhead beams and their supports shall be:

For steel..5
For timber and reinforced
concrete..6

(6) Pipes and Wiring.

(a) All electric wiring shall be in accordance with the rules and regulations made in accordance with the provisions of M. G. L. c. 143, § 3L, as most recently amended.

(b) No pipes, ducts, vessels, electrical conduits or cables shall be located within an elevator shaftway or hoistway or its pit other than those used to furnish or control light, heat, sprinklers, communications or signals for the elevator or hoistway, or for low voltage fire detection systems for the hoistway.

(c) No electric circuit having a nominal voltage in excess of 250 volts, shall be used for the operation, control or motor circuit.

(d) All live parts of electrical apparatus in the hoistway shall be suitably enclosed to protect against accidental contact.

23.03: Hoistway Guards

(1) Counterweight Runway.

(a) Where the counterweight runway comes down to a floor or passes a floor or stairs, it shall be enclosed at least seven feet above the floor or stairs by an enclosure which is either solid or with openings not exceeding ⅜" square .

(b) Access shall be provided for inspection, maintenance and repair of counterweight and ropes. The door to the counterweight runway enclosure shall be self-closing.

(2) Protection of Hoist Ropes.

(a) Where hoist ropes pass through a floor or stairs outside the hoistway enclosure, they shall be solidly enclosed to a height of not less than seven feet above the floor or the stair tread. The floor openings shall not be greater than necessary for free passage of the ropes.

(b) Hoist ropes immediately adjacent to stairs shall be guarded with solid or grille panel on the stair side to a height of not less than seven feet above the stair treads. Enclosures shall be solid, or open work with openings not exceeding ⅜" square.

23.04: Landings

(1) Hoistway Doors.

(a) Landing openings shall be protected by swing or horizontal sliding doors. Hoistway doors shall be of solid wood core or its equivalent and shall be not less than six feet six inches high.

(b) The clearance between the hoistway enclosure door and the hoistway edge of the landing sill shall not exceed three inches and the distance between the hoistway face of the landing door and the car door or gate shall not exceed four inches.

(c) The hoistway face of the landing door shall not project into the hoistway beyond the landing sill. No hardware, except that required for locks, contacts, or signals shall project into the hoistway beyond the line of the landing sill.

(d) Hoistway doors shall be provided with locking devices and electric contacts conforming to the following: "The locking device shall either be of a type which will prevent starting the car unless the door is locked in the closed position, or it may permit the car to start with the door in the closed position and not locked, provided the device will stop the car if the door fails to lock, before the car has moved more than 12" away from the landing. The device shall also prevent opening any hoistway door unless the car is within 12" of that landing."

(e) No means shall be provided which will open any landing door from the landing side when the car is not in the landing zone.

(f) Hoistway doors shall be so arranged that it will not be necessary to reach back of any panel, jamb or sash to operate them.

(g) Means shall be provided to prevent hangers for sliding hoistway doors from jumping the track. Stops will be provided to prevent the hanger carriage from leaving either end of the track, or suitable stops shall be provided on the door.

(2) Light in Car. There shall be an electric light to illuminate the car, with its switch place near the car entrance within easy reach of a person before entering the car.

Other Than: Elevators in unenclosed hoistways.

(3) Guide Rail Construction.

(a) Car and counterweight guide rails shall be of steel.

(b) Guide rails shall be securely fastened.

Guide rails and their fastenings shall not deflect more than ¼" under normal operation.

Joints of guide rails shall be well fitted and strongly secured.

Guide rails and their joints and fastenings shall withstand the application of the "SAFETY" when stopping the fully loaded car.

(c) The guide rails shall extend from the bottom of the hoistway to a height above the top landing sufficient to prevent the guide shoe from running off the guides when the car or counterweight are at the extreme upper position.

23.05: Counterweight

(1)(a) Counterweights, where used, shall run in guides.

(b) If a car counterweight is used, it shall not be of sufficient weight to cause undue slackening of any car hoist rope at start or stop of the car.

(c) The counterweight sections, whether or not carried in a frame, shall be fastened together to prevent rattle and displacement.

(d) There shall be no gas lines under the car or counterweight runways.

(e) Counterweights requiring a safety shall operate by a speed governor and shall be of the instantaneous type at a maximum tripping speed of 75 feet per minute.

(2) Car Construction.

(a) Elevator cars shall have metal or combination metal and wood suspension frames and platforms with safety factor of not less than five based on the contract load.

(b) Cast iron shall not be used in the construction of any member of the car frame or platform other than for guide shoes and guide shoe brackets.

23.05: continued

(c) No glass shall be used in a residence elevator car except for car light and appliances necessary for the operation of the car.
(d) The car shall have but one compartment.
(e) No elevator shall have more than two openings.

(3) Car Enclosure.
(a) Other than at the entrance the car shall be enclosed at sides and top. The enclosure at the sides shall be solid or of open work which will reject a ⅜" diameter ball.
(b) The car enclosure shall be secured in such manner that it cannot work loose or become displaced in regular service.

(4) Car Gate.
(a) A car door or gate shall be provided at each entrance to the car. This door or gate shall, when closed, guard the opening to a height of at least six feet six inches and if on an electric or electrically controlled hydraulic elevator, shall be provided with an electric contact which will prevent operation of the elevator unless the car door or gate is within two inches of full closure.
(b) The car door or gate may be manually operated, power operated, or may be closed by a weight or spring. Collapsible gates shall not be power-opened more than nine inch from full closure.
(c) Car gates shall be of a design that when fully expanded will reject a three inch diameter ball.
(d) When the hoistway enclosure is omitted at the bottom landing the car gate shall be provided with a mechanical lock which will lock it in the closed position when the car is more than six inches away from any landing. Car door release shall be provided to permit the door or gate to be opened at any point of car travel.
(e) Car door or gate contacts shall be positively opened by a lever or other device attached to and operated by the door or gate.
(f) Car door or gate contacts shall be maintained in the open position by the action of gravity or a restrained compression spring or both, or by means of a positive linkage.

23.06: Safeties

(1) Safety Construction and Operation.
(a) Elevator cars suspended by wire ropes or chains shall be provided with a car safety capable of stopping and sustaining the car with contract load.
(b) The car safety shall operate by a speed governor and be of the instantaneous type at a maximum tripping speed of 75 fpm.
(c) If speed governor is used, it shall be located where it cannot be struck by the car or counterweight in case of over-travel and where there is sufficient space for full movement of the governor parts.
(d) The motor-control circuit and the break control circuit shall be opened before or at the same time the safety applies.
(e) The governor ropes shall be of iron, steel Monel metal or phosphor bronze not less than ¼" in diameter. Tiller rope construction shall not be used for governor ropes.
(f) Elevators of the winding drum type with rope suspension shall be provided with a slack rope device of the manually reset type which will cut off the power and stop the elevator machine if the car is obstructed in its descent and the hoist ropes slacken. Elevators with roller chain suspension shall be provided with a slack chain device which will cut off the power and stop the elevator machine if the car is obstructed in its descent and the hoist chains slacken. This device need not be of the manually reset type if the chain sprockets are guarded to prevent the chain from jumping off the sprockets.
(g) No safety device which depends upon the completion and maintenance of an electric circuit for the application of the safety shall be used. Car safeties shall be applied mechanically.

Cast iron shall not be used in the construction of a car safety where its breakage might result in the failure of the safety to function to sustain the car.

23.06: continued

(2) Tests. Test of the car safety with contract load in the car shall be made before the elevator is put into service. Governor operation of instantaneous type safeties shall be tested at contract speed by tripping the governor by hand. Safeties operated as the result of the breaking of the hoist ropes shall be tested by obtaining the necessary slack rope to cause them to function.

(3) Capacity Plate. A metal plate shall be fastened in a conspicuous place in the car stating the contract load in pounds, in letters and figures not less than ¼" high.

(4) Limitations of Load, Speed and Platform Area. Where the contract load exceeds 700 lbs. or the contract speed exceeds 50 fpm, or the net inside car platform area exceeds 12 sq. ft., the elevator shall not be considered a "Private Residence Elevator" and shall conform to all requirements for "Power Elevators".

23.07: Machines

(1) Machines.

(a) Winding drums, traction sheaves and overhead and deflecting sheaves shall be of cast iron, or steel, of diameter not less than 30 times the diameter of the wire hoist ropes. The rope grooves shall be machined.

Where 8 x 19 plow steel ropes are used, the diameter of drums and sheaves may be reduced to 20 times the diameter of the rope.

(b) The factor of safety based on the static load (the contract load plus the weight of car, ropes, counterweights, etc.) to be used in the design of residence elevator hoisting machines shall not be less than:

Eight for wrought iron and steel.
Ten for cast iron, cast steel and other material.

(c) Set-screw fastenings shall not be used in lieu of keys or pins at a connection subject to torque or tension.

(d) No friction gearing or clutch mechanism shall be used for connecting the hoist drum or sheaves to the main driving gear.

(e) Gearing that have cast iron teeth shall not be used.

(f) Electric elevator machines shall be equipped with electrically-released spring-applied brakes.

(g) No single ground, short circuit, countervoltage or motor field discharge shall prevent the brake magnet from allowing the brake to set in the intended manner during normal operation.

(h) Electric elevator machine shall be arranged for manual operation by a crank in case of power failure and a suitable crank shall be provided and kept near the machine.

(2) Limit Switches. Upper and lower normal stopping devices shall be provided, set to stop the car at the upper and lower terminal landings. Final stopping devices shall be provided, set to operate if the car passes the terminal landings and stop the car before it strikes the overhead or pit bottom.

Where no hoistway enclosure is provided at the lower landing the final stopping device may be omitted at this landing.

The final terminal stopping device shall act to prevent movement of the car in both directions of travel.

The normal and final terminal stopping devices shall not control the same switches on the controller unless two or more separate and independent switches are provided, two of which shall be closed to complete the motor and brake circuit in each direction of travel.

(3) Operation.

(a) The following methods of operation are permitted:

1. Continuous pressure operation.

23.07: continued

2. Momentary pressure operation with up-down buttons or switches in the car and up-buttons or switches, or call buttons, at each landing. It is not required that the operation be selective.
3. Single automatic operation.

(b) A stop switch shall be provided on or adjacent to the operating panel. Stop switches shall be of the manually opened and closed type and shall be conspicuously marked "stop".

(c) No control system shall be used which depends upon the completion or maintenance of an electric circuit for:

1. Interruption of the power and application of the electro-mechanical brake at the terminals.
2. Operation of the car safeties, or
3. Stopping in response to the opening of the emergency stop switch.

(d) Hand-rope operation shall not be used.

(e) The sticking or freezing of any single electrically-operated switch, relay or contactor, or the occurrence of a single accidental ground, shall not permit the car to start if any hoistway or car door or gate is in the open position, and shall not permit the car to move more than 12" away from a floor with the hoistway door unlocked.

23.08: Suspension Means

(1) Suspension means shall be wire ropes or steel roller-type chains.

(2) There shall not be less than two such ropes or chains.

(3) Steel tapes as suspension means are prohibited.

(4) On elevators having a contract load of less than 450 lbs. and operating at a contract speed of less than 30 fpm, ropes shall not be less than ¼" in diameter. Where the contract load exceeds 450 lbs. or the contract speed exceeds 30 fpm, ropes shall not be less than three-eights inch in diameter.

(5) The factor of safety of the suspension means shall not be less than seven.

(6) When the car and counterweight are suspended by steel ropes and the driving means between the machine and the counterweight is an endless steel roller-type chain drive, the factor of safety of such chain with rated load on the car shall not be less than eight.

(7) The arc of contact of a wire rope on attraction sheave shall be sufficient to produce adequate traction under all load conditions. The arc of contact of a chain on a driving sprocket shall not be less than 140°.

(8) All wire ropes anchored to a winding drum shall have not less than one full turn of rope on the drum when the car or counterweight has reached its extreme limit of possible over-travel.

(9) No car or counterweight wire rope shall be lengthened or repaired by splicing. Broken or worn suspension chains may be repaired but the entire chain shall comply with 524 CMR 23.08(6).

(10) The winding drum ends of car and counterweight wire ropes shall be secured by clamps on the inside of the drum or by one of the methods specified in 524 CMR 23.08(11) below for fastening wire ropes to car or counterweight.

(11) The car or counterweight ends of wire ropes shall be fastened by return loop, spliced eyes, or individual tapered babbitted sockets or by properly attached fittings.

23.09: Emergency Signal

An emergency signal shall be provided operative from the car. This signal shall be audible outside the hoistway and may be a telephone connected to a central exchange.

REGULATORY AUTHORITY

524 CMR 23.00: M.G.L. c. 143, § 69.

NON-TEXT PAGE

524 CMR 24.00: PRIVATE RESIDENCE INCLINED POWER PASSENGER LIFTS

Section

24.01: Definition
24.02: Requirements

24.01: Definition

A private residence inclined passenger lift is a power lift installed in a private residence or a multiple dwelling as a means of access to a private residence in such a building, but only if the inclined lift is so installed and is not accessible to the general public or to any of the occupants of the building other than the person for whom it was installed.

24.02: Requirements

(1) The capacity shall not exceed two persons. The contract load shall not be less than 250 lbs. for a single-seat lift and shall not be less than 400 lbs. for a lift having two seats. The lift shall not serve more than two consecutive floors with a travel distance of not more than 40' on the incline and not more than 15' on the vertical.

(2) The contract speed along the incline shall not exceed 50 fpm.

(3) The carriage (or chair) shall have a foot platform with a seat or seats, and shall have hand grips so arranged as to provide safe support for passengers. Seats shall be provided with backs.

(4) The equipment shall be so constructed as to permit a free exit width of not less than 20 in. throughout the length of the stairway. If the seat and platform fold automatically when not in use, this clearance may be measured from the folded position.

(5) The carriage shall be securely anchored to a truck which supports it. The truck shall be retained in a track or guide rail assembly.

(6) The supporting guide rails shall be securely anchored to the stairs or side wall.

(7) The factor of safety used in the design of the carriage, truck, guide rails, sprockets and sheaves shall not be less than five based on contract load.

(8) The power unit shall be mounted on the carriage or placed at a remote location. If remotely located, all intervening sheaves or sprockets shall be placed so that the rope or chain travels in proper alignment. All machines, ropes, and sheaves shall be enclosed or guarded.

(9) The carriage shall be provided with a safety of the instantaneous type operating on failure or slackening of the hoist rope or chain. Operation of the safety shall open the motor and brake circuits. A slack-rope switch shall be provided which will cut off the power to the motor and brake if the hoist rope or chain fails or slackens, other than self-locking drives utilizing a lead-screw or other positive gearing which will stop and hold the carriage with contract load within not over four inches of downtravel after power is cut off.

(10) The lift shall be operated by continuous pressure up and down switches on the carriage and/or at the terminal landings.

(11) Winding drums and sheaves shall be of cast iron or steel of diameter not less than 30 times the diameter of the wire hoist ropes or aircraft cable. The rope grooves shall be machined.

Where 8 x 19 plow steel ropes are used, the diameter of the drums and sheaves may be reduced to 20 times the diameter of the rope.

24.02: continued

A single hoist rope, steel aircraft cable or roller type chain may be used. The diameter of the ropes or cables shall not be less than ¼" for elevator wire rope or one-eighth inch for steel aircraft cable. The factor of safety of said rope, cable, or chain shall not be less than seven.

(12) Upper and lower normal terminal stop switches shall be provided set to stop the carriage at the normal top and bottom terminals of travel. A final stop switch shall be provided, set to stop the carriage should it over-travel the normal top terminal.

The normal terminal switches shall be located at terminal landings or on the carriage or chair and operated by the movement of the carriage or chair.

The final terminal stopping device shall act to prevent movement of the carriage in both directions of travel. The normal and final terminal stopping devices shall not control the same switches on the controller unless two or more separate and independent switches are provided, two of which shall be closed to complete the motor and brake circuits in each direction of travel.

(13) A machine brake shall be provided, of the electrically-released spring-applied type, other than self-locking drives utilizing a lead-screw or other positive gearing which will stop and hold the carriage with contract load within not over four inch of down-travel after power is cut off.

The hoisting machine shall be directly connected to the motor, or may be connected to the motor by multiple V-belts, or by a multiple-link belt-type chain. Where a chain or belt-drive machine is used, a broken-chain or broken-belt switch shall be provided to cut off the power to the motor and brake if the chain or belt fails or slackens.

(14) All electrical wiring shall be in accordance with 527 CMR 12.00, the Massachusetts Electrical Code, as most recently amended.

REGULATORY AUTHORITY

524 CMR 24.00: M.G.L. c. 143, § 69.

524 CMR 25.00: BUILDERS' ELEVATORS

Section

25.01: Definition
25.02: Supporting Structures
25.03: Protection of Openings
25.04: Car Construction
25.05: Ropes
25.06: Signals
25.07: Inspection
25.08: Riders

25.01: Definition

The term builders' elevators shall mean elevators which have been erected for temporary use and built in or adjoining a building under construction or alterations.

25.02: Supporting Structures

(1) The supporting structures of builders' elevators shall be enclosed the entire height with heavy mesh wire except at loading or unloading platforms or landings. The wire enclosure shall have not greater than two inch mesh, and shall be securely fastened to the shaftway cross-bracing and struts.

(2) Guide rails shall be securely fastened in position and of such strength and design that the guides and their fastenings shall not deflect between their supports to cause the guide rails to spread causing failure of the safety dogs when applied to retard the car.

(3) No belt or chain driving machine shall be used to drive any power elevator.

25.03: Protection of Openings

(1) Inside landing openings of all such elevators shall be protected to a height of five feet and full width of the opening by a door or gate either solid or perforated; and if perforated it shall be able to reject a ball two inches in diameter.

(2) The outside landing opening shall be protected to its full height and width by a gate or door, either solid or slatted, and if slatted it must be able to reject a ball two inches in diameter. The lower bar shall be not more than two inches above the landing sill.

(3) An electric contact shall be installed on each movable bar or gate which will act as a signal to the operator when the bar or gate is open. All contacts shall be kept in good operating conditions.

25.04: Car Construction

(1) The car frame or sling of all such elevators shall be constructed and designed to adequately and safely sustain the maximum load to be imposed upon it. Where wood is used for the car floor, it shall be sound and at least two inches in thickness and shall be securely fastened and braced to the stiles. It likewise shall be capable of sustaining the maximum load imposed upon it. If the floors of cars are covered with metal they shall have a non-slip surface.

(2) Builders' elevators shall be equipped with a car safety device which shall bring the car to rest if the hoisting ropes become slack or break. If any part of the car of such elevators, including the car frame, sling or floor, is of other than steel construction, the elevator shall be equipped with undercar safeties.

25.05: Ropes

(1) Ropes for builders' elevators shall not be less than ½" in diameter. They shall be of steel and shall possess a factor of safety of at least eight. A metal tag shall be placed on each rope, at a point readily accessible to inspectors, showing the size and material of the rope, including the maximum safe load and the date of installation.

(2) The ends of hoist and counterweight ropes shall be fastened by spliced eyes, individual tapered sockets, open type wire rope clips, open wedge type sockets, or drop forged safety clips. Where spliced eyes are used, a thimble connection shall be installed in the eye. Where tapered sockets are used, the ends of each strand shall be filled with zinc or babbitt. Where clips are used the fastenings shall consist of not less than three approved clips spaced six rope diameters apart on each rope. "U" bolt type clips shall be installed with the "U" bolt on the dead end of the rope. Splicing of ropes is prohibited. "U" bolt type clips shall not be used to fasten spare ropes stored to permit extended travel of the car.

Note: Drop forged safety clips having two halves that are identical and providing a bearing surface for both the live and dead ends of the rope and providing a full bearing surface against the rope and securely fastened shall be used to fasten the spare rope for extended travel.

(a) Wire enclosure for builders' elevators installed outside a building or structure where specified shall not be required to be enclosed unless a staging is installed or located within ten feet of the elevator hoistway. The car shall be totally enclosed on all unused sides and top and each car opening shall be provided with a gate or door equipped with an electric contact provided the elevator is operated by electric power. Where the elevator is operated by other than electric power, the gate or door contact may be omitted. The hoistway shall be totally enclosed with a solid enclosure not less than seven feet high at the bottom terminal landing.

(b) The car gates are to be not less than six feet high and shall guard the full width and height of the opening.

(3) Ropes and fastenings shall be maintained in safe operating conditions.

(4) Ropes shall be prevented from "overriding" on the drum by use of a swivel "snatch block" or deflector sheave, which will permit proper wrapping of the rope on the drum. All "snatch blocks" or deflector sheaves shall be securely fastened to the legs or base of the supporting structure.

25.06: Signals

An audible, manually operated signal system, which can be operated from each floor landing, shall be used on all builders' elevators. The system shall include and be connected to a gong which shall be not less than six inches in diameter and shall be located in the machine room. The system shall be kept in good operating condition.

25.07: Inspection

(1) Builders' elevators shall not be put in use until written approval has been received from the department or inspector having jurisdiction. The approval shall be posted in a conspicuous place in the enclosure housing the hoisting mechanism.

(2) A contract-load test shall be made by a licensed elevator mechanic and witnessed by a state, city, or town authorized inspector of every builders' elevator before the elevator is placed in regular service. This test shall be made with contract load in the car. The brakes, limit switches, buffers, car safety, and speed governor shall be caused to function in each test, and approval of any elevator shall be granted only upon satisfactory completion of such test.

A safety test shall be made by a licensed elevator mechanic and witnessed by a state, city, or town authorized Inspector after each extension of travel before the elevator is again placed in regular service.

25.08: Riders

No person shall be allowed to ride on builders' elevators.

REGULATORY AUTHORITY

524 CMR 25.00: M.G.L. c. 143, § 69.

NON-TEXT PAGE

524 CMR 26.00: CERTAIN ELEVATOR EQUIPMENT USED AS AUTOMOBILE PARKING DEVICES.

Section

26.01: Reasons for Special Regulations for So-Called Automatic Parking
26.02: Reference to Safety Codes
26.03: Scope and Classification
26.04: Definitions
26.05: Construction of Hoistways and Hoistway Enclosures
26.06: Hoistway Gates in Non-Fire-Resistive Hoistways
26.07: Protection at Other Levels
26.08: Guide Rails, Guide Rail Supports and Fastenings
26.09: Car and Counterweight Buffers
26.10: Car Frames and Platforms: Design Requirements
26.11: Car Enclosures and Car Gates
26.12: Car and Counterweight Safeties and Speed Governors
26.13: Driving Machines
26.14: Roped Hydraulic Elevators
26.15: Requirements for Capacity and Loading
26.16: Terminal-Stopping Devices and Operating and Control Devices
26.17: Requirements for Suspension Means
26.18: Inspection, Tests, Maintenance and Alterations
26.19: Members of the Public Not Allowed Above Receiving Level

26.01: Reasons for Special Regulations for So-Called Automatic Parking

524 CMR 10.00 has been developed in response to demands for a separate section of the rules to cover the installation of certain elevator equipment in buildings or structures used exclusively for the parking of motor vehicles. It was felt that in many such installations, particularly where no person rides the elevator during the parking process, reasonable safety does not require that the elevators meet all of the requirements of the Massachusetts Elevator Code for conventional elevator installations.

26.02: Reference to Safety Codes

Installations shall be in accordance with accepted standards of engineering practice and, except as provided herein, shall conform to the minimum requirements of 524 CMR 17.00. In case any question arises as to what is the best engineering practice, design, installation and tests conforming to the AMERICAN NATIONAL STANDARD REQUIREMENTS FOR ELEVATORS, DUMB-WAITERS, ESCALATORS AND MOVING WALKS, ANSI A17.1 (*) shall be considered as conforming thereto.

26.03: Scope and Classification

(1) Scope.

(a) 524 CMR 26.00 applies only to: Elevators used exclusively for the parking of automobiles where, during the parking process, each automobile is moved either under its own power, or by means of a power-driven parking device onto and off the elevator directly into parking spaces or cubicles in line with the elevator, where no persons are normally employed or stationed in the parking areas.

Also, devices used exclusively for the raising of automobiles above, or lowering them below, the point of loading automobiles on the device for the purpose of storing them on the device itself.

(*) "ANSI A17.1, AMERICAN NATIONAL STANDARD SAFETY REQUIREMENTS FOR ELEVATORS, DUMB-WAITERS, ESCALATORS, AND MOVING WALKS" may be purchased from American National Standards Institute, Inc., 1430 Broadway, New York, N. Y. 10018.

26.03: continued

(b) 524 CMR 26.00 does not apply to: The design of the structure, of a crane or similar device on which the elevator may be mounted, or the design of any automobile parking dolly or mechanism, except the interlocking of the control of such device with the elevator control.

(2) Classification. Elevator equipment subject to 524 CMR 26.00 shall be classified as follows:

Class I. Elevators on which, during the parking process, one attendant rides for the purpose of operating the elevator and for the purpose of operating a power-driven parking device or dolly to move the automobile onto and off the elevator, but is not required to get off the elevator.

Class II. Elevators on which, during the parking process, one attendant rides for the purpose of operating the elevator and driving the automobile, under its own power, onto and off the elevator.

Class III. Elevators operated from a central dispatching station or stations and on which the garage attendants do not ride during the parking process, and the operation of the elevators and the entire process of parking the automobile is automatically controlled.

26.04: Definitions

Definitions in 524 CMR 16.00 shall apply to 524 CMR 26.00 installations unless otherwise modified herein.

26.05: Construction of Hoistways and Hoistway Enclosures

(1) Hoistway Enclosures at Levels Where Patrons Deliver or Receive Motor Vehicles. Hoistway enclosures for Class I, II and III elevators shall be provided as follows:

At all floors at which the customer delivers or receives his motor vehicle, hoistway enclosures shall be provided at portions of the hoistway accessible to the public.

Enclosures may be perforated for their entire height and need not be higher than six feet.

(2) Hoistway Opening Protection at Floors Where Patrons Deliver or Receive Motor Vehicles. Hoistway gates conforming to 524 CMR 26.06 shall be provided at each hoistway opening accessible to the public.

26.06: Hoistway Gates in Non-Fire-Resistive Hoistways

(1) Operation of Hoistway Gates. Gates shall be power-operated, or they may be power-opened and may close by gravity if means are provided to limit the closing speed. Power opening and closing devices shall conform to the requirements of 524 CMR 17.00.

(2) Design and Construction of Hoistway Gates. Gates may be perforated for their entire height, and need not be higher than six feet.

(3) Hoistway Gate Locking Devices. Hoistway gates on Class I, II and III elevators shall be provided with interlocks, mechanical locks and contacts, or separate mechanical locks.

Exception: Locking devices are not required on vertically-sliding gates whose unbalanced weight is 65 lbs. or more when the car is not at the landing.

(4) Devices for Preventing Movement of Car Unless Gate is Closed. Means shall be provided to prevent movement of the car in either the vertical or horizontal direction away from a landing unless the gate at that landing is in the closed position.

Exception: The means provided may permit horizontal movement of the car with the gate open in a zone of not more than two feet in either direction, provided that protective guards not less than six feet high and the width of the zone are installed on each side of the tower.

26.06: continued

For cars having more than one hoistway or runway opening at a given loading position, a separate closing means shall be provided for each car door or gate and its corresponding hoistway or runway door or gate.

(5) Clearance Beneath Hoistway Gate. The vertical clearance beneath the lower edge of the gate and the landing shall be not more than eight inches.

26.07: Protection at Other Levels

At levels other than floors where patrons deliver or receive motor vehicles, hoistway opening protection shall conform to the following:

(1) Adequate means shall be provided to retain the automobiles in the parking cubicles against the force of the wind or of gravity.

(2) Ropes or other dividers not less than 42" high shall be provided between the parking cubicles.

26.08: Guide Rails, Guide Rail Supports and Fastenings

Guide rails, guide rail supports and fastenings shall conform to 524 CMR 17.00.

26.09: Car and Counterweight Buffers

(1) Car and counterweight buffers shall conform to the following:

(a) Class I and II Elevators. Car and counterweight buffers shall be installed in accordance with the requirements of 524 CMR 17.00.

Exception: Spring buffers may be used under the following conditions:

1. For electric elevators whose rated speed is not more than 300' per minute.
2. For hydraulic elevators whose maximum speed in the down direction with rated load is not more than 300' per minute.
3. The stroke of spring buffers for car speeds exceeding 200' per minute shall be equal to or greater than the following:

201 - 250 ft. per min. - 6¼"
251 - 300 ft. per min. - nine inches

(b) Class III Elevators. Car and counterweight buffers shall be required only where there are occupied spaces or passageways underneath the hoistway, in which case both car and counterweight buffers shall be installed in accordance with the requirements of 524 CMR 17.00 provided that such buffers may be located at each side of the car frame.

(2) Counterweights. Counterweights, where provided, shall conform to ASA A17.1, Section 202.

26.10: Car Frames and Platforms: Design Requirements

Car frames, car platforms and their guiding members of Class I, II and III elevators shall conform to the requirements of 524 CMR 17.00.

Exceptions:

(a) The flooring may be perforated provided the openings will reject a ball having a diameter of two inches or more.

(b) Where a parking dolly is used the portion of the floor where the dolly travels may be depressed.

(c) Four corner suspension roped hydraulic elevators are not required to have car crossheads.

26.11: Car Enclosures and Car Gates

(1) Car Enclosures. Cars shall be enclosed on all sides not used for entrance and exit, with enclosures conforming to 524 CMR 17.00 provided that the enclosure need be only six feet high, may be of openwork construction for its entire height, and no car top shall be required.

Exceptions:

(a) For Class I and II Elevators the enclosures may be omitted provided:

1. The car can be operated from the car only and the car-operating device is permanently located and is of a type which will return automatically to the stop position when the hand of the operator is removed.

2. The operator's station is protected on the outside with an openwork metal enclosure at least six feet high which will reject a ball 1½" in diameter and where no car gate is provided is located not less than four feet from the nearer end of the platform.

3. A metal railing at least 42" high is provided, on the sides of the car not used for entrance and exit.

(b) For Class III Elevators -- The enclosure specified may be omitted if a metal railing at least 42" high is provided on the sides of the car not used for entrance and exit.

(2) Car Gates. A car gate shall be provided at each car entrance and shall be equipped with means to prevent the movement of the car in either the vertical or horizontal direction away from a landing unless the gate is in the closed position.

Exceptions:

(a) The means provided to prevent movement of the car may permit horizontal movement of the car with the gate open in a zone of not more than two feet in either direction provided protective guards not less than six feet high and the width of the zone are installed on each side of the tower.

(b) The car gate may be omitted provided the following conditions are conformed with:

1. Where a dolly is used, means are provided to prevent operation of the elevator unless the dolly is properly positioned on the car platform.

2. When the motor vehicle is on the car platform means are provided to prevent operation of the elevator, unless the motor car is properly centered on the platform so that no portion of the vehicle projects beyond the platform.

3. For Class I and II elevators where the elevator can be operated from the car only by means of a permanently located operating device of a type which will return automatically to the stop position when the hand of the operator is removed.

26.12: Car and Counterweight Safeties and Speed Governors

(1) Car Safeties. Car safeties conforming to 524 CMR 17.00 shall be provided. All operating parts of the safety shall be protected from the elements.

Exceptions:

(a) Car safeties may be omitted on:

1. Direct plunger elevators.

2. On Class III elevators where there is no occupied space or passageway underneath the hoistway.

(b) The car safety device may be located in the upper part of the car frame instead of beneath the platform provided the car frame, car platform, car safety and the guide rails and their supports are designed to withstand the forces from loading and unloading and from application of the car safety at governor tripping speed with rated load on the platform within the stresses and deflections permitted by 524 CMR 17.00.

(2) Counterweight Safeties. Counterweight safeties shall be provided where there is an occupied space or passage underneath the hoistway.

26.12: continued

(3) Speed Governors. Car or counterweight safeties, where required or used, shall be operated by speed governors conforming to 524 CMR 17.00.

Exceptions: The tripping speed of speed governors for roped hydraulic elevators shall be based on the maximum speed attained by the elevator car in the down direction with rated load on the platform instead of on rated speed.

26.13: Driving Machines

(1) Electric Driving Machines. Electric driving machines shall conform to the requirements of 524 CMR 17.22.

(2) Hydraulic Driving Machines, Valves, Piping, Connections and Tanks. Hydraulic driving machines, valves, piping, connections and tanks shall conform to the requirements of 524 CMR 17.23.

Exception: Roped hydraulic driving machines may be used provided they conform to the applicable requirements of 524 CMR 26.14.

26.14: Roped Hydraulic Elevators

(1) Piston Rod Stops. Piston rods of roped hydraulic elevators shall be so constructed and so roped that the piston shall be stopped before the car can be drawn into the overhead structure. Travel-limiting stops of ample strength shall be provided in the cylinder to bring the piston to rest under full pressure without damage to the cylinder assembly or hydraulic system. Such stops shall be of the solid metal-to-metal type.

(2) Traveling Sheaves. Traveling sheaves of roped hydraulic elevators shall be guided in metal guides. Sheave frames, where used, shall be of structural or forged steel having an elongation of not less than 14% in a length of two inches and shall be designed and constructed with a factor of safety of at least eight. A single continuous strap shall not be used for the sheave frame.

(3) Cylinders, Valves, Piping, Connections and Tanks. Cylinders, valves, piping, connections and tanks shall conform to the requirements of 524 CMR 17.23.

(4) Piston Rods. Piston rods of roped hydraulic elevators shall conform to the following:

(a) Piston rods in compression shall be designed and constructed in accordance with the applicable formula for plungers.

(b) Piston rods in tension shall be designed and constructed in accordance with the following formula:

$$W = 7500A$$

Where: W = Allowable gross load, pounds applied to piston rod

A = Net cross-sectional area at root of threads in square inches.

(c) Means shall be provided to prevent eccentric loading on piston rods and to equalize loading on piston rods where two or more are used.

26.15: Requirements for Capacity and Loading

The capacity and loading requirements of 524 CMR 17.00 shall be conformed with, provided that the minimum rated load shall be based on the maximum weight of the motor vehicles to be parked and shall in no case be less than 5,000 lbs. per vehicle to be carried.

In addition to the information required by 524 CMR 17.00 the crosshead data plate or a separate plate attached to the crosshead shall indicate the maximum speed of the car in the down direction with rated load on the platform for which the elevator is designed.

26.16: Terminal-Stopping Devices and Operating and Control Devices

(1) Terminal-Stopping Devices. Terminal-stopping devices shall conform to the requirements of 524 CMR 17.00 for hydraulic elevators, provided that for roped hydraulic elevators there shall be installed, in addition to the terminal-stopping devices therein specified, a separate automatic stop valve independent of the normal control valve and mechanically operated directly by the movement of the car.

(2) Operating and Control Devices. Operating and control devices shall conform to the requirements of 524 CMR 17.00 for electric elevators and for hydraulic elevators.

(a) Roped hydraulic elevators may have lever type operating devices provided they are self centering when released by the operator.

(b) The following electrical protective devices shall not be required:

1. Top of car operating device.
2. Stop switch on top of a car.
3. Hoistway door interlocks or electric contacts. (See 524 CMR 26.06(3)).
4. Car door or gate electric contacts. (See 524 CMR 26.11(2)).
5. Stop switch in pit.
6. Car emergency stop switch for roped hydraulic elevators with lever type operating devices.

Class III elevator cars shall be provided with a constant pressure operating device for operating the car for inspection, maintenance, and during emergencies, which shall be operative only when the operating device at the control dispatching station is inoperative. Means shall be provided at the central dispatching station for disconnecting the normal operating device and for making the constant pressure operating device in the car operative.

26.17: Requirements for Suspension Means

The suspension means for electric and hydraulic elevators shall conform to 524 CMR 17.00.

Car platforms may be suspended by wire ropes attached to each corner of the platform, subject to the following:

(1) A center car frame conforming in all respects to 524 CMR 17.00 shall be provided except that the car crosshead may be omitted, providing:

(a) The car frame stiles extend partly above and partly below the car platform so that the vertical distance between the top and bottom guide shoes on the car frame is not less than 40% of the distance between guiderails or of the length of the car platform, whichever is greater.

(b) Guiding members or rope connections are so designed and installed as to prevent binding of the car frame in the guide rails when the car is raised and lowered.

(2) The car safety required by 524 CMR 26.12 is mounted on the center car frame located as required in 524 CMR 17.00.

(3) The car safety shall be operated by a speed governor.

26.18: Inspection, Tests, Maintenance and Alterations

Inspections, tests, maintenance and alterations shall conform to the requirements of 524 CMR 17.00 and of M.G.L. c. 143, § 64 as amended by St. 1972, c. 807.

26.19: Members of the Public Not Allowed Above Receiving Level

No person other than those whose services are necessary for the operation, maintenance, or safety of the premises shall be permitted on an elevator or on any level other than the receiving level.

26.20: Operators to Be Licensed

No person shall operate, and no owner, lessee, employer or his agent shall cause or permit any elevator to be operated except by a person duly licensed for such service by the Commissioner of Public Safety.

Exception: An operator's license shall not be required of an elevator contractor or of a qualified licensed mechanic engaged in the construction, maintenance, or repair of elevators or elevator hoistways, or of an inspector having authority to inspect elevators.

(1) Granting of Licenses

(a) Whoever desires to act as an operator of elevators herein required to be operated by a licensed person shall make application to the Commissioner on blanks to be furnished by the Department of Public Safety. A license shall not be granted to a person less than 18 years of age.

(b) The applicant shall be given a practical examination as to his knowledge of the operation of elevators, and if found competent shall be granted a license by the Commissioner.

(c) Special licenses shall be issued for Class I, Class II, and Class III elevators respectively. No license shall be valid except for the class elevator for which it has been issued. Licenses shall be for the term of one year from the date thereof, and may be renewed yearly by the department. If a license has not been renewed within three years from the date of issuance, a re-examination shall be required.

(2) Display of Licenses. A licensed operator shall at all times when operating an elevator be prepared to display his license on demand of the owner or tenant of the building, or of any person authorized to inspect the elevator, or of any police officer.

(3) Revocation and Suspension of Licenses.

(a) A wilful falsification in the matter of a statement in an application shall be deemed sufficient cause for the revocation at any time of a license granted on said application.

(b) A license may be suspended or revoked by the Commissioner, if the holder is incompetent or untrustworthy or fails to comply with 524 CMR 26.00.

REGULATORY AUTHORITY

524 CMR 26.00: M.G.L. c. 143, § 69.

NON-TEXT PAGE

524 CMR 27.00: SPECIAL INDUSTRIAL POWER OPERATED SERVICE ELEVATORS

Section

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27.01: General

524 CMR 27.00 applies to elevators installed in broadcasting towers, cement storage towers, and similar structures which are not accessible to the general public, and for the exclusive use of special designated operating and maintenance employees only, where transportation of one and not more than three employees is required to attend or service machinery or other equipment requiring attention.

(1) No persons other than employees as described above shall be permitted to operate or ride thereon. Such elevators shall be removed when the structure is no longer used for the purpose for which it was originally designed.

(2) Elevators complying with the following regulations and where reference is made to 524 CMR 15.00 through 33.00 which is inclusive and must be complied with may be installed.

(3) In no case shall the following conditions be exceeded:
  (a) Inside area of car nine square feet.
  (b) Speed with load 100' per minute.
  (c) Contract load 750 lbs.
  (d) Operation only by means of push buttons.

27.01: continued

(4) Plans and specifications for such elevators shall be filed with the department where the elevators are to be installed and an erection permit secured in accordance with the requirements of M.G.L. c. 143, § 62, governing elevators before any work of installation is started. On completion of such elevators they shall be inspected and tested by the inspector having jurisdiction and shall not be placed in regular operation for the use of the persons for whom they are intended until the department has issued a Certificate of Operation. Such special elevators shall be subject to inspection at least once each year in accordance with M.G.L. c. 143, § 64, governing elevators, and, in addition, all safety devices shall be examined each six months.

27.02: Hoistway Enclosure

The hoistway shall be constructed and enclosed in accordance with the requirements of 524 CMR 17.00, except where building is of open construction throughout, and elevator does not travel through fireproof floors, grille or lattice work enclosure six feet high shall be provided around the hoistway at each floor. An enclosure shall be provided full height on open side or sides of the hoistway when hazards exist, such as stairways, passageways, and similar conditions.

27.03: Car Clearances

(1) There shall be a clearance of not less than ¾" between the car and the hoistway enclosure, and between the car and its counterweight.

(2) The clearance between the car platform and the landing threshold shall be not less than ½", nor more than 1½".

27.04: Pits and Overtravel

(1) The structure at bottom of hoistway shall be sufficiently strong to withstand without failure the impact of the car with contract load, also the impact of the counterweight, when either is descending at contract speed, or at governor tripping speed if governor-operated safety is used.

(2) A pit not less than two feet in depth shall be provided at the lowest story served and a substantial spring bumper shall be located therein set to strike steel safety plank of car. A minimum of one foot clearance shall be provided under the platform when the car rests on the fully compressed bumper.

(3) At the top landings there shall be a clearance between top of car crosshead and machine supports or any other obstruction vertically above the car of not less than two feet when the counterweight rests on its fully compressed buffers and a clearance between the top of the counterweight and any obstruction vertically above it of not less than six inches when the car rests on its fully compressed buffers. Where no counterweight is provided, clearance between the top of the car crosshead and the machines, supports or other obstruction vertically above it when the car is at its uppermost landing shall be not less than two feet six inches.

27.05: Machine and Machinery Supports

(1) All machinery and sheaves shall be supported and secured so as to effectually prevent any part becoming loose or displaced. The supporting beams shall be steel.

(2) Loads on overhead beams and their supports shall be computed as follows: the total load on overhead beams shall be assumed as equal to the weight of all apparatus resting on the beams plus twice the maximum load suspended from the beams. The load resting on the beams shall include the complete weights of machine, sheaves, controller, etc. The load suspended from the beams shall include the sum of the tensions of all ropes suspended from the beams.
Note: The object in doubling the suspended load is to allow for impact, acceleration stresses, etc.

27.05: continued

(3) No elevator machinery or sheaves shall be fastened to the underside of the supporting beams at the top of the hoistway.
Exception: The idler or deflecting sheaves with their guards and frames.

Supporting members for sheaves and other elevator machinery underneath beams shall not be of cast iron in tension.

(4) The factor of safety for overhead beams and their supports shall be for steel................five

27.06: Pipes and Wiring

All wiring shall comply with requirements of 524 CMR 17.06.

(1) No pipes conveying steam, gas or liquids, which if discharged into the hoistway would endanger life, shall be installed in the elevator or counterweight hoistway.

(2) Voltage of control circuits shall not be in excess of 250 volts.

(3) All live parts of electrical apparatus in the hoistway shall be suitably enclosed to protect against accidental contact.

27.07: Counterweight Runway

Sides of the counterweight runway exposed to the outside of the hoistway or structure shall be guarded, except where building is of open construction throughout, and elevator does not travel through fireproof floors, grille or lattice work enclosure six feet high shall be provided around the hoistway at each floor. An enclosure shall be provided full height on open sides of the hoistway when hazards exist such as stairways, passageways and similar conditions.

27.08: Protection of Hoist Ropes

All hoist and counterweight ropes shall be located inside the hoistway enclosure.

27.09: Hoistway Doors

(1) Landing openings shall be protected by manually-operated doors or gates of the horizontally swinging or sliding type or vertically sliding type. Grille or lattice type construction shall not be used where fire resistive hoistway enclosures are required. The construction of doors and gates shall conform to 524 CMR 17.07.

Exception: Where the car operates in open steel towers without designated landing floors or levels.

(2) Where swing type doors are used, the clearance between the hoistway enclosure door or gate and the hoistway edge of the landing sill shall not exceed two inches and the distance between the hoistway face of the landing door and the car door or gate shall not exceed four inches. Where sliding type doors with door closures are used, the clearances specified may be increased to two inches and five inches respectively.

(3) The hoistway face of the landing door or gate shall not project into the hoistway beyond the landing sill. No hardware, except that required for door-operating devices, locks, contacts or signals, shall project into the hoistway beyond the line of the landing sill.

(4) Hoistway doors shall be provided with approved interlocks conforming to 524 CMR 17.10.

27.09: continued

(5) No means shall be provided which will open any landing door from the landing side when the car is not in the landing zone.

(6) Hoistway doors shall be so arranged that it will not be necessary to reach back of any panel, jamb or sash to operate them.

(7) Means shall be provided to prevent hangers for sliding hoistway doors from jumping the track. Stops will be provided to prevent the hanger carriage from leaving either end of the track, or suitable stops shall be provided on the door.

27.10: Light in Car

There shall be an electric light to illuminate the car with its switch placed near the car entrance within easy reach of a person before entering the car.

27.11: Guide Rail Construction

(1) Car and counterweight guide rails shall be of steel.

(2) Guide rails shall be securely fastened in position with brackets, through bolts, ties, clips or backing of such strength, design and spacing that the guide rails and their fastenings shall not deflect between supports more than ¼" under normal operation. Joints of guide rails shall be accurately machined with tongue and groove if tee rails are used, or doweled if other solid shape rails are used, and fastened with splice plates to prevent movement in any direction.

(3) The guide rail shall extend from the bottom of the hoistway to a height above the top landing sufficient to prevent the guide shoes from running off the guides when the car or counterweight is at the extreme upper position.

27.12: Counterweight

Counterweights, where used, shall run in guides located within the elevator hoistway and shall comply with 524 CMR 17.30.

27.13: Car Construction

(1) Elevator cars shall have metal car frames and outside frames of platforms with a safety factor of not less than five based on the rated load.

(2) Cast iron shall not be used in the construction of any member of the car frame or platform other than for guide shoes and guide shoes brackets.

(3) No glass shall be used in an elevator car except for car light and appliances necessary for the operation of the car.

(4) The car shall have but one compartment.

(5) The car shall be so constructed and weighted that it will descend upon failure of the suspension means.

27.14: Car Enclosure

(1) Except at the entrance, the car shall be enclosed at sides and top. The enclosure at the sides shall be solid or of open work which will reject a ½" diameter ball.

Exception: An aperture not in excess of 30 square inches shall be permissible in the inside of car enclosures of elevators operating in open steel towers. Such apertures shall be located not less than 54" nor more than 60" above the car floor and shall be equipped with a horizontal sliding cover to close the opening when not in use.

27.14: continued

(2) The car enclosure shall be secured in such manner that it cannot work loose or become displaced in regular service.

27.15: Car Gate

(1) A car door or gate shall be provided at each entrance to the car. This door or gate shall, when closed, guard the full height of the opening, and if on an electric or electrically controlled hydraulic elevator shall be provided with an electric contact or interlock which will prevent operation of the elevator unless the car door or gate is within two inches of full closure. Car doors or gates may be horizontal or vertical sliding.

(2) The door or gate shall be manually operated.

(3) Car gates shall be of a design that when fully expanded will reject a three inch ball.

(4) Car door or gate contacts shall be positively opened by a lever or other device attached to and operated by the door or gate and shall not be solely dependent on gravity or springs or both for their opening.

(5) Car door or gate contacts shall be maintained in the open position by the action of gravity or a restrained compression spring or both, or by means of a positive linkage.

27.16: Car Safety Construction and Operation

(1) Elevator cars suspended by wire ropes shall be provided with a car safety located beneath the car platform and capable of stopping and sustaining the car with contract load.

(2) The car safety shall be of a type operated as the result of the breaking of the suspension means, or by a speed governor. If of the speed governor type, it must operate to set the safety at a maximum speed of 175' per minute, except that on the breaking of the hoist ropes, the safety shall operate without appreciable delay and independently of the governor speed action.

(3) If a speed governor is used, it shall be located where it cannot be struck by the car or counterweight in case of overtravel and where there is sufficient space for full movement of the governor parts.

(4) The motor-control circuit and the brake-control circuit shall be opened before or at the same time the safety applies.

(5) The governor rope shall be iron, steel, Monel metal or phosphor bronze not less than three-eighths inch in diameter. Tiller rope construction shall not be used for governor ropes.

(6) Elevators of the winding drum type with wire ropes suspension shall be provided with a slack rope device of the manually reset type which will cut off the power and stop the elevator machine if the car is obstructed in its descent and the hoist ropes slacken.

(7) No safety device which depends upon the completion and maintenance of an electric circuit for the application of the safety shall be used. Car safeties shall be applied mechanically. Cast iron shall not be used in the construction of a car safety where its breakage might result in the failure of the safety to function to sustain the car.

27.17: Tests

Test of the car safety with contract load in the car shall be made before the elevator is put into service. Governor operation of instantaneous type safeties shall be tested at contract speed by tripping the governor by hand. Safeties operated as the result of the breaking of the hoist ropes shall be tested by obtaining the necessary slack rope to cause them to function.

27.18: Capacity Plates

A metal plate shall be fastened in a conspicuous place in the car stating the contract load in pounds, in letters and figures not less than ¼" high.

27.19: Limitations of Load, Speed and Platform Area

Where conditions do not conform in all respects with the requirements of 524 CMR 27.00, the elevator installation shall conform to all requirements of 524 CMR 17.00.

27.20: Machines and Sheaves

(1) Winding drums, traction sheaves and overhead and deflecting sheaves shall be of cast iron or steel, of diameter not less than 40 times the diameter of the wire hoist ropes. The rope grooves shall be machined.

(2) The factor of safety based on the static load (the contract load plus the weight of car, ropes, counterweights, etc.) to be used in the design of these elevator hoisting machines shall not be less than

Eight for wrought iron and steel.
Ten for cast iron, cast steel and other material.

(3) Set-screw fastenings shall not be used in lieu of keys or pins at a connection subject to torque or tension.

(4) No friction gearing or clutch mechanism shall be used for connecting the hoist drum or sheaves to the main driving gear.

(5) Gearing having cast iron teeth shall not be used.

(6) Electric elevator machines shall be equipped with electrically released spring applied brakes which will apply automatically when the operating device or stopping contacts are in the stop position.

(7) No single ground, short-circuit, counter-voltage or motor-field discharge shall prevent the brake magnet from allowing the brake to set when the operating device or stopping contacts are in the stop position.

(8) Electric elevator machines may be arranged for manual operation by crank in case of power failure and a suitable crank should be provided and kept near the machine.

27.21: Limit Switches

Upper and lower normal stopping devices shall be provided, set to stop the car at the upper and lower terminal landings operated by switches and cams attached to the car and hoistway. Final stopping devices shall be provided, set to operate if the car passes the terminal landings and stop the car before it strikes the overhead or pit bottom. The final terminal stopping device shall act to prevent movement of the car in both directions of travel. The normal and final terminal stopping devices shall not control the same switches on the controller unless two or more separate and independent switches are provided, two of which shall be closed to complete the motor and brake circuit in each direction of travel. Drum type machines shall also be provided with automatic machine terminal stop switches.

27.22: Operation and Operating Devices

(1) The following methods of operation are permitted:
- (a) Double button control.

27.22: continued

(b) Momentary pressure operation with up-down buttons or switches in the car and up-down buttons or switches, or call buttons, at each landing. It is not required that the operation be selective.
(c) Single automatic operation.
(d) Operation may be by remote control.

(2) A stop switch shall be provided on or adjacent to the operating panel. Stop switches shall be of the manually opened and closed type and shall be conspicuously marked "stop" and the operating button or handle shall be of a different color from any other switch in the car. The opening of the switch contacts shall not be solely dependent on springs.

(3) The control systems shall be designed so that the direction of travel of the elevator can be reversed at any point in the hoistway after stopping the elevator from the stop switch or any other method. No control systems shall be used which depend upon completion of maintenance of an electric circuit for:

(a) Interruption of the power and application of the electro-mechanical brake at the terminals.
(b) Operation of the car safeties, or
(c) Stopping in response to the opening of the emergency stop switch.

(4) Hand-rope operation shall not be used.

(5) The sticking or freezing of any single electrically operated switch, relay, or contactor or the occurrence of a single accidental ground shall not permit the car to start if any hoistway landing door is open or unlocked, or if any car door or gate is not within two inches of full closure.

(6) Each electric power elevator driven by a polyphase alternating current motor shall be provided with a device which will prevent starting the motor if:
(a) the phase rotation is in the wrong direction, or,
(b) there is a failure in any phase.
524 CMR 27.00 does not apply to AC motor used to drive motor-generator sets.

27.23: Suspension Means

(1) Suspension means shall be wire ropes. Tiller rope is not permissible.

(2) There shall be not less than two such ropes.

(3) Steel tapes as suspension means are prohibited.

(4) Ropes shall not be less than ½" in diameter.

(5) The factor of safety of the suspension means shall not be less than 7.

(6) The arc of contact of a wire rope on a traction sheave shall be sufficient to produce adequate traction under all load conditions.

(7) All wire ropes anchored to a winding drum shall have not less than one full turn of rope on the drum when the car or counterweight has reached its extreme limit of possible overtravel.

(8) No car or counterweight wire rope shall be lengthened or repaired by splicing.

(9) The winding drum end of car and counterweight wire ropes shall be secured by clamps on the inside of the drum or by one of the methods specified in 524 CMR 27.23(10) below for fastening wire ropes to car or counterweight.

27.23: continued

(10) The car or counterweight ends of wire ropes shall be fastened by return loop, by properly made individual tapered babbitted sockets or by spliced eye.

(11) A metal tag shall be placed on all wire rope fastenings, or be permanently fixed on the car frame, upon which shall be stamped the size, material and manufacturer's rated ultimate strength of the rope and the name of person or company installing the ropes and the date of installation or renewal.

27.24: Emergency Signal

An emergency signal shall be provided operative from the car. This signal shall be audible outside the hoistway and may be a telephone connected to a central exchange.

27.25: Maintenance of Elevators

In order to insure the safe operation of elevators installed in broadcasting towers and cement towers subject to extreme weather conditions, and before being placed in service, they shall conform to the following requirements:

Lubrication. All parts of the machinery and equipment requiring lubrication shall be lubricated at regular intervals with lubricants of a grade as recommended by the manufacturer.

27.26: Guide Rails

Except those of elevators equipped with roller or other type guiding members not requiring lubrication, guide rails should be kept well lubricated.

(1) Rails on which a lubricant is used shall be cleaned down at least once a year.

(2) Rust-preventive compounds such as paint mixtures or other anti-rust coatings shall not be used as they may interfere with the proper operation of the car safety.

27.27: Car Safety Mechanisms

All moving parts of car safety mechanisms shall be kept clean and free of rust and dirt and shall be lubricated at frequent intervals. This is especially important where the safety mechanism is exposed to water, corrosive vapors, or freezing conditions, as corrosion or rusting of the parts may prevent operation of the safety.

27.28: Machine and Brake

Machine lubricant subject to freezing conditions shall be specified by the manufacturer. Transformer oil with low pour point and low viscosity shall be used in all brake pots where brake coils and magnets are submerged.

(1) All fulcrum pins operating in brake levers shall be of non-ferrous metal or the liners bushed with non-ferrous bushings.

(2) The heads of all rivets fastening brake linings and all metal in contact shall be sealed to avoid freezing to brake pulley.

27.29: Instructions

Elevator subject to extreme weather conditions should make a trial trip without personnel on the car to make sure the operating mechanism is in good order.

REGULATORY AUTHORITY

524 CMR 27.00: M.G.L. c. 143, § 69.

524 CMR 28.00: TEMPORARY WORKMEN'S ELEVATORS FOR BUILDING CONSTRUCTION

Section

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28.02: Hoistway Enclosures: General
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28.16: Temporary Use of Permanent Elevators for Carrying Workmen or Materials
28.17: Devices Included Under Requirements of 524 CMR 28.00

28.01: Scope, Application and Requirements

(1) 524 CMR 28.00 applies only to:
(a) passenger elevators installed in or outside of buildings during construction, alteration or demolition, and used primarily to raise and lower workmen only during the construction, alteration or demolition of the building, and
(b) temporary use of permanent elevators for carrying workmen or materials.

(2) Workmen's elevators may also be used for carrying materials, provided they are designed and installed for the type of loading to be used, as specified in 524 CMR 17.15(3).

(3) Elevator hoistways shall conform to the requirements of 524 CMR 28.02. All other equipment shall conform to 524 CMR 17.00, except as may be hereinafter excepted.

28.02: Hoistway Enclosures: General

(1) Hoistways shall not be located, either partially or wholly, over sidewalks or passageways to which the public or workmen have access.
Exception: Installations conforming to 524 CMR 17.05(7).

(2) The hoistway construction forming the supports for the elevator machinery and guide rails shall conform to the requirements of 524 CMR 28.03, 17.30(6), 17.30(7), 17.30(8) and 17.30(9).

(3) Hoistways shall be enclosed throughout their height.

(4) Hoistway enclosures shall be constructed of solid or openwork material conforming to the following requirements:
(a) If of openwork material, they shall reject a ball 1½" in diameter, and if of metal shall be made of wire at least No. 16 steel wire gage or of expanded metal at least No. 16 U.S. gage.
(b) If made of wood, they shall be installed without openings.
(c) Openwork enclosure inside the building shall, where a counterweight is provided, be covered on the counterweight side with a steel wire netting having a mesh not greater than ½" and made of steel wire not smaller than No. 20 steel wire gage. The covering shall extend the width of the counterweight plus one foot on each side thereof.
(d) Be so supported and braced that when subjected to a pressure of 100 lbs. applied horizontally at any point, the deflection shallnot exceed one inch and shall not reduce the running clearance below the minimum required by 524 CMR 28.04(2).

28.02: continued

(e) If of openwork, be provided on all sides within the building or structure with an unperforated kick plate extending not less than 12" above the level of each floor above the lowest, and a guard rail 42" high, not less than 18" outside the hoistway, constructed of 1" x 6" board.
(f) If of openwork material, they shall be enclosed solid to a height of six feet six inches on the hoistway door side.

28.03: Machine Room, Sheave Room and Secondary Levels

(1) Overhead beams and foundations for the direct support of the elevator machinery and/or sheaves shall conform to the requirements of 524 CMR 17.02(12) through 17.02(14).

(2) A solid floor or metal grating shall be provided at the top of the hoistway where necessary to provide safe access to the overhead machinery, control equipment or sheaves for lubrication, inspection and maintenance. Floors may be of wood, metal or concrete. Metal gratings shall be of a design which will reject a ball ¾" in diameter, or if of perforated sheet metal shall reject a ball one inch in diameter. Floors or gratings shall be designed and constructed to sustain a concentrated load of 300 lbs. on any four square inches of thin area. It is not required that the floor sustain the load specified on every four square inches of its area simultaneously.

(3) Machinery and control equipment shall be protected from the weather and from access by unauthorized persons. Spaces containing elevator driving machines and control equipment shall be provided with electric lighting.

(4) Access shall be provided to the machinery and control spaces to permit proper lubrication and maintenance of the equipment.

28.04: Clearance and Pits

(1) The top and bottom clearances and run-bys for cars and counterweights shall conform to 524 CMR 17.04(2), 17.04(3).

(2) Horizontal clearances in the hoistway shall conform to 524 CMR 17.04(1).

28.05: Pipes and Wiring

(1) Electrical wiring shall conform to 524 CMR 17.06.
Exceptions:
(a) Elevator travelling cable without encasement may be used for the hoistway wiring provided it is securely fastened to the hoistway construction, and where exposed to weather, as in open shafts outside the building, is of the weather-proof type.
(b) Temporary feeders for the elevator may be run inside the hoistway provided 524 CMR 17.06(8) is fully complied with.

(2) Where the hoistway is exposed to the weather, as in open shafts outside the building, the electrical fittings, fixtures and switches shall be of the weather-proof type.

28.06: Hoistway Doors: General

(1) Hoistway doors shall be not less than six feet six inches high. Solid doors shall be provided with a vision-panel opening covered with wire mesh conforming to 524 CMR 28.02(4)(c).

(2) Hoistway doors shall be provided with electrical interlocking devices specified in 524 CMR 17.10, or they may be provided with an electro-mechanical lock so that they cannot be opened from the landing side. Locking devices shall be so located as to be inaccessible from outside the hoistway, and of a type which can be released only by a person in the elevator car or by a cam attached to the car.

28.06: continued

Exception: The door at the lowest terminal landing shall be provided with means to unlock it from the landing side to permit access to the car. The means provided shall be accessible only to authorized persons.

28.07: Car Construction

Cars shall be constructed in accordance with 524 CMR 17.13.

Exception: Car platforms shall not be required to be protected on the underside against fire.

28.08: Car Enclosures

(1) Car enclosures shall conform with 524 CMR 17.14.
Exception: Car enclosure sides may be of untreated wood without sheet metal outer covering and the car top shall consist of not less than two-inch thick wood or material of equivalent strength.

(2) All entrances to the car shall be protected by doors or gates conforming to the requirements of 524 CMR 17.14(2), provided that they are not required:
(a) To be more than six feet high.
(b) To reject a ball less than 4½" in diameter.
(c) To conform to 524 CMR 17.14(4)(a) provided that vertically sliding gates or doors may be used subject to 524 CMR 28.08(3).

(3) Vertically sliding doors and vertically sliding gates, when used, shall conform to the following:
(a) They shall be of the balanced counterweighted type which slide in the up direction to open, operating in guides.
(b) They shall reject a ball two inches in diameter.
(c) They may be manually operated.
(d) They shall have their counterweights enclosed in conformity with 524 CMR 17.14(6)(f).

(4) Doors and gates shall be provided with car-door or gate-electric contacts conforming to 524 CMR 17.14(7).

28.09: Car and Counterweight Safeties and Speed Governors

Car and counterweight safeties and speed governors shall conform to 524 CMR 17.16.
Exception: Instantaneous type car safeties may be used for rated car speeds up to and including 200' per minute.
Rack and pinion car safeties not exceeding car speeds of 325 feet per minute may be installed within the car frame rather than below the lower member of the car frame (safety plank) provided the safeties are so designed that on their application the forces which provide the stopping action are compressive forces on each side of the guide rail section, and provided an application for a variance and plans are submitted and approved by the Board of Elevator Regulations.

28.10: Contract Speed

The maximum contract speed of Temporary Workmen's Elevators shall not exceed 400' per minute.
Exception: Elevators installed for use during construction of any building, provided that the machine and other equipment are part of the permanent installation.

28.11: Contract Load and Test

(1) The capacity and loading shall conform to 524 CMR 17.15(2).

(2) The elevator shall not be used to carry workmen until it has been inspected and tested as required by 524 CMR 17.19 inclusive, and until a temporary operating permit therefor has been issued by the enforcing authority and posted in a conspicuous place in the elevator car.

(3) The travel of the elevator may be increased or the location of the driving machine changed without conforming to the requirements of 524 CMR 15.00(c) and 15.00(d). When the travel of the elevator is increased, the installation shall be reinspected and approved by the enforcing authority before it is again placed in normal service. Additional tests are not required, except when considered necessary by the enforcing authority.

(4) The elevator shall be subject to periodic and maintenance tests as required by M.G.L. c. 143, §§ 63, 64 and 65.

(5) All parts of the elevator equipment shall be maintained in a safe operating condition in accordance with the requirements of Massachusetts Elevator Code Regulations.

28.12: Machine and Machinery

Driving machines shall be of the electric type and shall conform to 524 CMR 17.22. Winding-drum machines shall have grooved drums and only one layer of rope shall be permitted on the drum.

28.13: Hoisting Ropes

(1) Power elevators shall be provided with iron or steel wire hoist and counterweight ropes conforming to 524 CMR 17.26.

Exceptions: The ends of hoist and counterweight ropes may be fastened by spliced eyes, individual tapered sockets, return loop, open wedge type sockets, (or drop forged safety clips). Where spliced eyes, open wedge type sockets, or drop forged safety clips are used, a thimble connection shall be installed in the eye. Where tapered sockets are used, the ends of each strand shall be socketed in full compliance with 524 CMR 17.26(14) through 17.26(18). Where clips are used, the fastenings shall consist of not less than three approved clips spaced six rope diameters apart for each rope. Splicing of ropes or extending the length of ropes by other means is prohibited. "U" bolt type clips shall not be used to fasten the ends of hoist ropes, counterweight ropes or spare ropes stored to permit extended travel of the car. Drop forged safety clips or clamps having two halves that are identical and providing a bearing surface for both the live and dead ends of the rope and providing a full bearing surface against the rope and securely fastened shall be used to fasten the spare rope for extended travel.

(a) Wire enclosures for workmen's elevators installed outside a building or structure where specified shall not be required to be enclosed their full height unless a staging, platform, or other load bearing structure is installed or located within ten feet of the elevator hoistway. The car shall be totally enclosed on all unused sides and top and each car opening shall be provided with a gate or door equipped with an electric contact. The hoistway shall be totally enclosed with a solid enclosure not less than seven feet high at the bottom terminal landing.

(b) Car gates are not to be less than six feet high and shall guard the full width and height of the opening.

(c) Under conditions where mechanical and electrical equipment are exposed to the elements or where there is moisture in the hoistway and condensation due to changes in temperature of the air, special precautions shall therefore be taken where installing the electrical wiring and other equipment to insure its stability under exposure to weather and severe conditions to which it is subjected.

28.13: continued

(2) Power elevators shall be provided with iron or steel wire hoist and counterweight ropes conforming to 524 CMR 17.26.

28.14: Guide Rails, Buffers and Counterweights

(1) Guide rails shall conform to 524 CMR 17.30.
Exception: Clamps may be used for fastening guide brackets or supports to the building construction. Finished surfaces are required only for the guide rail guiding surfaces which come in contact with the car safety mechanism.

(2) Car and counterweight buffers shall conform to 524 CMR 17.31.
Exception: Spring-type car and counterweight buffers may be used for rated speeds not exceeding 300' per minute provided that for rated speeds of more than 200' per minute the buffer stroke shall be not less than:
(a) 201-60-250 feet per minute = six inches
(b) 251-60-300 feet per minute = nine inches

(3) Counterweights shall conform to 524 CMR 17.32.

28.15: Control and Operating Devices and Systems

(1) Control and operating devices and systems shall conform to 524 CMR 17.33, 17.34, and 17.35.
Exceptions:
1. The stop switch in the pit and on top of the car shall not be required.
2. Operation of the elevator shall be only by means of a car switch or by continuous pressure-type switches located in the car.
3. Elevators used to carry workmen shall be operated only from inside the car by a competent designated operator.

(2) Where the primary source of power consists of a direct current generator driven by gasoline motor, means shall be provided on each elevator controller to absorb the energy regenerated by a direct-current elevator motor under overhauling load conditions.

(3) Where a nonrotating or other type rectifying unit, which is incapable by itself of absorbing the energy generated by the elevator driving-machine motor as a result of overhauling loads, is used to transform alternating current to direct current for the operation of a direct-current elevator motor or motors, means shall be provided on each elevator controller to absorb a sufficient amount of the energy regenerated by the elevator motor under overhauling load conditions to prevent the elevator from attaining at any time a speed of more than 125% of the speed in the up direction with rated load in the car.

28.16: Temporary Use of Permanent Elevators for Carrying Workmen or Materials

(1) Use During Construction. Passenger or freight elevators being installed in buildings for permanent use may be used prior to their completion during construction of the building for carrying workmen or materials, provided they are specifically approved for such use and a temporary permit therefor issued by the enforcing authority.

(2) Workmen and Materials. Workmen and materials shall not be carried at the same time.
Exception: Elevators may be used by the minimum number of persons for accompanying and handling the materials.

(3) Requirements for Issuing Limited Operating Permits. Limited operating permits shall be issued providing the following requirements are conformed to:
(a) The hoistway has been enclosed with permanent enclosures and doors conforming to 524 CMR 17.01 or with temporary enclosures and doors conforming to 524 CMR 28.02(3), 28.02(4), and 28.06.

28.16: continued

Exception: Where permanent enclosures conforming to 524 CMR 17.01 are in place, temporary hoistway doors and door-locking devices conforming to 524 CMR 28.06 may be used.

(b) The elevator car has been enclosed with permanent car enclosures and doors or gates conforming to 524 CMR 17.14(1) through 17.14(4) or with temporary enclosures, doors or gates conforming to 524 CMR 28.08 and car doors or gates are provided with electric contacts conforming to 524 CMR 17.14(7).

Where the hoistway is not fully enclosed with solid material on all sides throughout its height, a temporary wood car enclosure conforming to 524 CMR 28.07 through 28.09 shall be provided:

(c) If the car is arranged so that it can be operated from inside the car only and a competent designated operator is in charge.

Exception: Where the permanent hoistway doors and door-locking devices conforming to 524 CMR 17.07 through 17.10 are in place, automatic operation or continuous pressure operation elevators may be operated from the car and from the landing operating devices without the services of a regular operator in the car, subject to the approval of the enforcing authority.

(d) If the elevator has been subjected to the following tests:

1. A running test with rated load, making stops at each landing. On this test the rated speed shall not exceed that specified on the erection permit approved by the enforcing authority.

2. A test of the normal and final stopping devices with no load in the up direction and rated load in the down direction has been made which indicates compliance with 524 CMR 17.36.

3. A test of the car safety device and speed governor has been made in accordance with the requirements of 524 CMR 17.19.

(4) Posting of Permits. Permits shall be posted in a conspicuous location in the elevator car. In addition, a notice bearing the information that the elevator has not been finally approved by the enforcing authority shall be conspicuously posted on, near, or visible from each entrance to such elevators.

28.17: Devices Included Under Requirements of 524 CMR 28.00

(1) Workmen's hoists and other similar equipment shall be considered temporary workmen's elevators and shall be installed and operated only by a person holding a Commonwealth of Massachusetts license for the construction, maintenance and repair of elevators.

(2) Overhead Protection: There shall be installed on all workmen's hoists or similar devices a roof to protect the workers from falling objects. The roof shall be constructed of solid material.

(3) Workmen's hoists and other similar equipment must be equipped with the following safety devices:

(a) a safety device which acts on a wire rope which is supported independently from the rigging used to support and hoist the working platform;

(b) a safety device which grabs the wire rope used to support and hoist the working platform;

(c) instantaneous safeties.

(4) Workmen's hoists and other similar devices must be provided with a 42" guard rail completely around the platform area and a 12" kick plate completely around the platform area.

(5) Inspection and Load Tests: There shall be a load and safety test performed on all such devices prior to their use on each job site, and at other times the inspector having jurisdiction deems necessary.

REGULATORY AUTHORITY

524 CMR 28.00: M.G.L. c. 143, § 69.

524 CMR 29.00: STAGE. ORCHESTRA. AND ORGAN CONSOLE ELEVATORS

Section

29.01: Definitions
29.02: Hoistway Construction
29.03: Clearance and Pits
29.04: Machine Rooms, Sheave Rooms and Secondary Levels
29.05: Hoistway Doors
29.06: Railings and Toe Boards
29.07: Guide Rails
29.08: Door Interlocks
29.09: Lifting Capacity
29.10: Stage Elevators
29.11: Control Apparatus for Orchestra and Organ Console Elevators
29.12: Driving Machines
29.13: Control and Operating Devices and Systems
29.14: Factor of Safety

29.01: Definitions

(1) Stage Elevators. A stage elevator shall mean a platform consisting of a section of the stage arranged to be raised and lowered to or above and below the stage level in a vertical direction at a speed not exceeding 15' per minute.

(2) Orchestra Elevator. An orchestra elevator shall mean the platform for raising and lowering musicians of an orchestra in a substantially vertical direction at a speed not exceeding 15' per minute.

(3) Organ Console Elevator. An organ console elevator shall mean a platform for raising and lowering an organ console including the organist, in a substantially vertical direction at a speed not exceeding 15' per minute.

(4) Standard Railing. A standard railing shall mean a railing not less than 42" in height with an additional rail between the top rail and the floor.

(5) Toe Boards. Toe boards shall mean a board not less than six inches in height placed at right angles with floor or platform to prevent objects from falling from the floor or platform to the spaces below.

(6) Car Aprons. Car aprons shall mean an enclosure of solid construction to enclose the space between the top of the hoistway enclosure and the underside of the platform when the platform extends above the top of the hoistway enclosure.

29.02: Hoistway Construction

The hoistways of Orchestra and Organ console elevators shall be of two hour fire resistive construction immediately below the top landing.

The complete surface of the hoistway within the limits of travel shall be of smooth finish, devoid of surface roughness, and without any projections or recesses except for landing entrances, guides, and guide brackets, vertical slots where required for concealed guides, junction boxes and conduit or wiring. All projections or recesses at landing entrances shall be bevelled on the under side or shall be guarded with metal plates. The angle of such bevels or guard plates shall not be less than 75° from the horizontal.

29.03: Clearance and Pits

A pit shall be provided at the bottom of every hoistway of such depth that when the platform is at its lowest limit of travel the distance between the lowest point of the under side of the platform framing shall be in accordance with the following: The clear vertical distance between the under side of the car platform or between the under side of any equipment attached thereto, exclusive of the car frame channels, car safety blocks, guide shoes and any aprons or guards attached to the car sill, and the pit-floor when the car rests on the fully compressed buffer shall not be less than two feet. In measuring this clearance, the depth of any trenches or depressions in the pit shall not be included. (See definition for car aprons.)

29.04: Machine Rooms, Sheave Rooms and Secondary Levels

All machine rooms shall be located above or below or contiguous to any side of the hoistway.

Exceptions: Oil hydraulic machine rooms and entrance to machine rooms shall be located not more than ten feet from any side of the hoistway.

29.05: Hoistway Doors

The bottom landing openings of hoistways shall be protected by sliding or swinging doors of 1½ hour fire resistive construction.

29.06: Railings and Toe Boards

Railings and toe boards shall be provided at floor levels of orchestra and organ console elevators. (See definition.)

29.07: Guide Rails

Steel guide rails shall be used for guides of stage and organ console elevators.

29.08: Door Interlocks

All hoistway landing doors shall be equipped with interlocks as described in 524 CMR 17.10(1) through 17.10(9).

29.09: Lifting Capacity

The lifting capacity of an orchestra or console elevator shall be equal to a live load of not less than 25 lbs. per square foot of floor area of the platform. All railings, aprons, wiring conduits, etc., shall be considered as part of moveable platforms.

29.10: Stage Elevators

The lifting capacity of a stage elevator shall be equal to a live load of not less than 75 lbs. per square foot of floor area of that platform.

29.11: Control Apparatus for Orchestra and Organ Console Elevators

Operating switches shall be provided in a suitable location on the platform of orchestra and console elevators.

An emergency stop switch, which will cut off the sources of power, shall be provided in the car adjacent to the operating device for all of the above elevators and shall be identified by the distinctive color of Red.

Emergency stop switches may be operated by buttons or levers but shall be of the manually opened and closed type so installed that when opened gravity will not tend to close the switch.

An emergency stop switch shall be installed in the pit of every orchestra and console elevator.

29.11: continued

A manually operated multiple disconnecting switch shall be installed in the main line of each electric orchestra or console elevator or motor generator set machine.

The disconnect switch shall be located adjacent to and visible from the elevator machine or motor generator set to which it is connected and shall, where practicable, be located in the machine room at the lock jam side of the entrance door.

29.12: Driving Machines

Where elevating screws are used they shall be of the direct connected type, either worm or bevelled gears, and all gears shall be enclosed in a protective housing.

Where a stage, orchestra or console elevator is not supported or operated by either screws, plungers or similar means, car safeties shall be provided under the platform capable of stopping and holding the platform with full rated load at any point of its travel.

29.13: Control and Operating Devices and Systems

(1) Motor Controller. A suitable lighted room shall be provided outside of the hoistway for the motor controller and brake unless the motor and controller and brake are located in the pit in which case masonry piers or columns shall be provided of sufficient strength to take the impact of a full loaded car.

(2) Location of Motor and Controller. Where the motor and controller are located in a hoistway pit or in a pit adjacent to the lifting platform, access to same shall be provided by means of a door entirely below the bottom of the platform when the platform is at its lowest limit of travel.

This door shall be of sufficient width and height to make the entrance readily accessible.

(3) Terminal Limit Switches. Enclosed terminal limit switches located in the hoistway shall be provided and arranged to automatically bring the car platform to rest as it approaches either terminal landing.

(4) Final Limit Switches. Enclosed final limit switches shall be provided at the top and bottom of the hoistway arranged to cut off the current and stop the platform if it should travel beyond the terminal limit switch. Electric power elevators having winding drum machines shall have the stopping switches on the machines and also in the hoistway operated by the movement of the car.

29.14: Factor of Safety

(1) Elevator Platform Construction. The platform of stage, orchestra, organ console elevators shall be of steel frame construction designed with a safety factor of not less than six based on the rated load, uniformly distributed.

All other parts of the equipment shall have a safety factor as required by the elevator regulations outlined in 524 CMR 15.00 through 33.00.

(2) Installations in the Same Hoistway. When orchestra and organ console elevators are installed in the same hoistway the adjacent sides shall be provided with solid dividing wall partitions with not less than ¾ hour fire resistive construction.

When the travel of a stage, orchestra or organ console elevator extends above the top of the hoistway enclosure, aprons of substantial construction shall be provided on the platform of sufficient depth to enclose the space between the top of the hoistway enclosure and the under side of the platform plus three inches when the platform is at its limit of travel.

The lower edge of the aprons shall be bevelled at an angle of not less than 75° with the horizontal.

REGULATORY AUTHORITY

524 CMR 29.00: M.G.L. c. 143, § 69.

NON-TEXT PAGE

524 CMR 30.00: MOVING WALKS

Section

30.01: Scope and Purpose
30.02: Definitions
30.03: Design Requirements
30.04: Operating and Safety Devices, Electrical Equipment and Wiring.
30.05: Required Protection of Floor Openings
30.06: Required Protection of Supports and Machine Spaces Against Fire
30.07: Tests and Inspections

30.01: Scope and Purpose

(1) The rules of 524 CMR 30.00 cover the criteria for the design, construction, installation, operation, inspection and testing of moving walks installed for the purpose of transporting passengers.

The rules do not apply to moving walks used as part of an industrial process or as part of a transportation system consisting of a combination of moving walks and cars.

(2) The purpose of 524 CMR 30.00 is to provide for the safety of life and limb, and to promote the public welfare.

(3) All electrical wiring shall be in accordance with the rules and regulations made in accordance with the provisions of M.G.L. c.143, § 3L, as most recently amended.

30.02: Definitions

The terms used in the text shall have the following meanings:

Landing. The stationary area at the entrance to or exit from a moving walk or moving walk system.

Moving Walk. A type of passenger-carrying device on which passengers stand or walk and in which the passenger-carrying surface remains parallel to its direction of motion and is uninterrupted.

Moving Walk, Belt Type. A moving walk with a power-driven continuous belt treadway.

Moving Walk, Belt Pallet Type. A moving walk with a series of connected and power-driven pallets to which a continuous belt treadway is fastened.

Moving Walk, Pallet Type. A moving walk with a series of connected and power-driven pallets which together constitute the treadway.

Moving Walk, Roller-Bed Type. A moving walk with the treadway supported by a succession of rollers with their axes at right angles to the direction of treadway motion.

Moving Walk, Slider-Bed Type. A moving walk with the treadway sliding upon a supporting surface.

Moving Walk System. A series of moving walks in end-to-end or side-by-side relationship with no landing between treadways.

Pallet. One of a series of rigid platforms which together form an articulated treadway or the support for a continuous treadway.

Slope. The angle which the treadway makes with the horizontal.

Threshold Comb. The toothed portion of a threshold plate designed to mesh with a grooved treadway surface.

30.02: continued

Threshold Plate. That portion of the landing adjacent to the treadway consisting of one or more stationary or slightly movable plates.

Treadway. The passenger-carrying member of a moving walk.

Shall. The term "shall" where used shall be construed as mandatory.

Should. The term "should" where used shall be construed as advisory.

Width. The width of a moving walk is the exposed width of the treadway.

30.03: Design Requirements

(1) Direction of Passage. Passage from a landing to a treadway or vice versa shall be in the direction of treadway travel at the point of passenger entrance or exit.

(2) Load Rating.
(a) Structural. For the purpose of structural design the load rating shall be considered to be not less than 100 lbs. per square foot of exposed treadway.
(b) Machinery. For the purpose of brake, treadway and power transmission calculations, the load rating shall be considered to be not less than 75 lbs. per square foot of exposed treadway.

(3) Width.
(a) Limitations. The width of a moving walk is the exposed width of treadway and shall be not less than 16". The maximum width shall depend both on the maximum treadway slope at any point on the treadway, and on the treadway speed. The width shall not exceed the value determined by Table 1 in 524 CMR 30.03.
(b) Change in Width. The exposed width of treadway shall not be decreased in the direction of travel.

This width requirement applies only to moving walks having entrance to or exit from landings. It is not intended to preclude development of moving walk systems in which changes in width are made safe and practical by direct passage from one treadway to another, subject to the approval of the enforcing authority.

(4) Maximum Width.

TABLE 1

Maximum Moving Walk Width

Maximum Treadway Slope at any Point on Treadway	140 fpm Maximum Treadway Speed	Above 140 fpm to 180 fpm Treadway Speed
0 to 3°	Unlimited	40 in.
above 3 to 5°	110 in.	40 in.
above 5 to 8°	78 in.	40 in.
above 8 to 12°	40 in.	..
above 12 to 15°	40 in.	..

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(5) Belt Type Treadways. Belt type treadways shall conform to the following:
(a) Factor of Safety. Belt type treadways shall be designed with a factor of safety of not less than five, based on ultimate strength.
(b) Splices. Splicing of the treadway belt shall be made in such a manner as to result in a continuous unbroken treadway surface of the same characteristics as the balance of the belt.

30.03: continued

(c) Grooving. The treadway surface shall be grooved in a direction parallel to its travel for the purpose of meshing with comb-plates at the landings. Each groove shall be not more than ¼" wide at the treadway surface and not less than 3/16" deep; and the distance from center to center of adjoining grooves shall be not more than ½". Sides of grooves may slope for mold draft purposes and may be filleted at the bottom.

(6) Belt Pallet Type Treadways. Belt Pallet type treadways shall conform to the following:
(a) Factor of Safety. Pallet connecting chains or other connecting devices between pallets, and pallets where part of the propelling system shall have a factor of safety of not less than ten, based on ultimate strength.
(b) Splices. Splicing of the treadway belt shall be made in such a manner as to result in a continuous unbroken treadway surface of the same characteristics as the balance of the belt.
(c) Grooving. The treadway surface shall be grooved in a direction parallel to its travel for the purpose of meshing with comb-plates at the landings. Each groove shall be not more than ¼" wide at the treadway surface and not less than 3/16" deep; and the distance from center to center of adjoining grooves shall be not more than ½". Sides of grooves may slope for mold draft purposes and may be filleted at the bottom.
(d) Alignment. Adjacent ends of pallets shall not vary in elevation more than 1/16". The fasteners that attach the belt to the pallets shall not project above the exposed treadway surface.

(7) Pallet Type Treadway. Pallet type treadways shall conform to the following:
(a) Factor of Safety. Pallet connecting chains or other connecting devices, and pallets where part of the propelling system, shall have a factor of safety of not less than ten, based on ultimate strength.
(b) Clearance Between Pallets. The maximum clearance between pallets shall be 5/32".
(c) Grooving. The treadway surface of each pallet shall be grooved in a direction parallel to its travel. Each groove shall be not more than ¼" wide at the treadway surface and not less than 3/16" deep; and the distance from center to center of adjoining grooves shall be not more than ½". Sides of grooves may slope for mold draft purposes and may be filleted at the bottom.
(d) Alignment of Pallet Tread Surfaces. Adjacent ends of pallets shall not vary in elevation more than 1/16".

(8) Treadway Slope. The slope of a treadway shall not exceed 15° at any point. (See 524 CMR 30.03(9) for interdependence of treadway speed and treadway slope.)

(9) Speed. Treadway speed shall conform to the following:
(a) Maximum Speed. The maximum speed of a treadway shall depend both on the maximum treadway slope at points of entrance or exit, and on the maximum treadway slope at any other point on the treadway. This speed shall not exceed the lesser of the values determined by Tables 2 and 3 in 524 CMR 30.03.

TABLE 2

Maximum Treadway Slope at Point of Entrance or Exit	Maximum Treadway Speed
0 to 3°	180 fpm
above 3 to 5°	160 fpm
above 5 to 8°	140 fpm
above 8 to 12°	130 fpm
above 12 to 15°	125 fpm

30.03: continued

TABLE 3

Maximum Treadway Slope at any Point on Treadway	Maximum Treadway Speed
0 to 8°	180 fpm
above 8 to 15°	140 fpm

(b) Higher Speeds. The maximum speeds listed in Tables 2 and 3 in 524 CMR 30.03 apply only to moving walks having entrance from or exit to landings. It is not intended to preclude development of moving walk systems in which higher speeds are made safe and practical by direct passage from one treadway to another, subject to the approval of the enforcing authority.

(10) Supports. Supports shall conform to the following:

(a) Slider Bed. The carrying portion of the treadway shall be supported for its entire width and length except where it passes from a support to a pulley. The surface of the slider bed shall be reasonably smooth. It shall be so constructed that it will not support combustion.

(b) Roller Bed. Where the treadway is supported on a series of rollers, the combination of roller spacing, belt tension and belt stiffness shall be such that the deflection of the treadway surface, midway between rollers, shall not exceed the quantity 0.094 inch + (0.004 times center to center distance of rollers in inches) when measured as follows:

1. The treadway surface shall be loaded midway between rollers with a 25 lb. weight concentrated on a cylindrical footpiece two inches long by one inch diameter placed with its long axis across the belt. Deflection of this footpiece from its unloaded position shall not exceed the figure obtained above.

2. The rollers shall be concentric and true running within commercially acceptable tolerances.

(c) Pallet and Belt Pallet Type. Pallet wheel tracks shall be so designed and located as to prevent more than ⅛" vertical displacement of the treadway should the pallet connection means break.

(11) Threshold Plates. The entrance to or exit from a moving treadway shall be provided with a threshold plate designed and installed to provide a smooth passage between treadway and landing and vice versa and conform to the following:

(a) Type Required. The threshold plate shall be provided with a comb.

(b) Clearance. The threshold comb teeth shall be meshed with and set into the grooves of the treadway surface so that end of the surface of the teeth are always below the upper surface of the treadway.

(c) Surface. The surface of the plate shall afford a secure foothold for a distance not exceeding four inches and not less than two inches from the threshold comb intersection with the treadway and shall be smooth from this point to the treadway surface.

(12) Balustrades. Moving walks shall be provided with an enclosed balustrade on each side conforming to the following:

(a) Construction. Balustrades without moving handrails shall be designed so as to provide no surfaces which can be gripped by a passenger. On the treadway side the balustrade shall have no areas or moldings depressed or raised more than ¼" from the parent surface. Such areas or moldings shall have all boundary surfaces beveled unless parallel to the direction of travel. The balustrades shall extend at normal height at least 12" beyond the end of the exposed treadway. Glass panels if used, shall be of the tempered type.

(b) Height and Flare. The height of a balustrade shall be not less than 30" measured perpendicular to the treadway surface. At this height, the inner surface of the balustrade shall be located not more than eight inches outside the vertically projected edge of the exposed treadway.

30.03: continued

(c) Clearance with Treadway. The clearance between the top surface of the treadway and the underside of the balustrade shall not exceed ⅛".

(13) Guards at Ceiling. Where the intersection of the balustrade (desk board) and the ceiling or soffitt is less than 24" from the center line of the handrail, a solid guard shall be provided in the intersecting angle. The vertical face of the guard shall have a height of at least seven inches and shall be rounded. Guard may be of glass if of the tempered type.

(14) Handrails. Handrails shall conform to the following:
(a) Number required. Two moving handrails shall be provided on each moving walk.
Exceptions:
1. Moving walks having a slope of 3° or less and a speed of 70' per minute or less.
2. Moving walks having a width of 21" or less where a single moving handrail may be used.
(b) Location. The moving handrail at both the entrance and exit landings shall extend at normal height at least 12" beyond the end of the exposed treadway. The point where the moving handrail enters or leaves an enclosure shall be not more than ten inches above the floor line.
(c) Handrail Guards. Hand or finger guards shall be provided at the points where the handrail enters the balustrade.
(d) Enclosure. The moving handrail return run and its driving and supporting machinery shall be fully enclosed.
(e) Speed. Each moving handrail shall move in the same direction and at substantially the same speed as the treadway.

(15) Connection Between Drive and Main Drive Shaft. The driving machine shall be connected to the main drive shaft by toothed gearing, a coupling or a chain.

(16) Brakes Required. Each moving walk shall be provided with an electrically released, mechanically applied brake capable of stopping and holding the treadway with any load up to the load rating. This brake shall be located either on the driving machine or on the main drive shaft.

Where a chain is used to connect the driving machine to the main drive shaft, a brake shall be provided on that shaft. It is not required that this brake be of the electrically released type if an electrically released brake is provided on the driving machine.

Exception: Slider bed and other moving walks which will not run in the down direction by gravity under any load condition up to their load rating with the power supply interrupted do not require brakes.

(17) Application of Brakes. Electrically released brakes specified in 524 CMR 30.03(16) shall stop the treadway automatically upon failure of power or when any of the safety devices specified in 524 CMR 30.04 operate. Brakes on the main drive shaft, if not of the electrically released type, shall be applied when the drive chain parts.

(18) Speed Reducers. Speed Reducers shall meet the requirements for design and application as established for the various types in the appropriate AGMA Practice Standards, as follows:
420.02 - 1951 - Helical and Herringbone Gear Speed Reducers
430.02 - 1954 - Spril Bevel Gear Speed Reducers
440.03 - 1959 - Single and Double Reduction Cylindrical - Worm and Helical - Worm Speed Reducers.
441.02 - 1954 - Double Enveloping Worm Gear Speed Reducers.
460.03 - 1953 - Gearmotors
480.01 - 1955 - Shaft Mounted Speed Reducers.
The loading shall be considered to be uniform and the service to be 24 hours per day.

30.03: continued

(19) Chain Drives. Chain drives shall be of the types covered by the following American Standards:

ASA B29.1 - 1957 - Transmission Roller Chains and Sprockets.
ASA B29.2 - 1957 - Inverted Tooth Chains and Sprockets.

When operating at the load rating of the treadway, the load imposed on such chains shall not exceed the horsepower rating as established by these standards.

The loading shall be considered to be uniform and the service to be 24 hours per day.

(20) V-Belt Drives. When operating at the load rating of the treadway the load imposed on V-Belt drives shall not exceed the horsepower rating as established by the American Standard Specification for Multiple V-Belt Drives (ASA B55.1 - 1961). The loading shall be considered to be uniform and the service to be 24 hours per day.

(21) Others. Pallet propelling chains and drive components other than those specified shall have a factor of safety of not less than ten, based on ultimate strength.

(22) Supporting Structure. The supporting structure for the treadway, balustrades and machinery shall conform to American Standard Specification for the Design, Fabrication and Erection of Structural Steel for Buildings, ASA A57.1 - 1952.

30.04: Operating and Safety Devices, Electrical Equipment and Wiring

(1) Devices Required. Operating and safety devices shall be provided conforming to the following requirements:

(a) Starting Switch. Starting switches shall be of the key-operated type and shall be located within sight of the exposed treadway.

(b) Emergency Stop Switches. Emergency Stop buttons or other types of manually operated switches having red buttons or handles shall be accessibly located at every entrance to and exit from a moving walk, and shall be protected against accidental operation. The operation of any of these buttons or switches shall interrupt the power to the driving machine and to the brake, where provided. It shall be impossible to start the driving machine by these buttons or switches.

(c) Broken Drive-Chain Device. Where the driving machine is connected to the main drive shaft by a chain, and where a brake is located on that shaft when required by 524 CMR 30.03(16) a device shall be provided which will cause the application by such brake if the drive chain parts.

(d) Speed Governor. Moving walks required by 524 CMR 30.03(16) to be equipped with a brake, or which are driven by a direct current motor, shall be provided with a speed governor which will cause the interruption of power to the driving machine and to the brake, where provided, should the speed of the treadway exceed a predetermined value, which shall be not more than 40% above the maximum designed treadway speed.

Exception. Moving walks driven by low slip-alternating current induction motors directly connected to the driving machine do not require speed governors and the governor may be omitted in such cases even where a chain is used to connect the sprocket on the driving machine to the sprocket on the main drive shaft as permitted by 524 CMR 30.03(15).

(d) Broken Treadway Device for Belt Pallet and Pallet Type. A device shall be provided which will cause interruption of power to the driving machine and to the brake, where provided, if the connecting means between pallets break.

(f) Power Interruption. Where a device is required to interrupt power, such interruption shall not be subject to intentional delay. The use of a supplemental and independent device with or without intentional delay is permissible.

30.04: continued

(2) Electrical Equipment and Wiring. Electrical equipment and wiring shall conform to the following:

(a) Disconnect Switch. An enclosed, fused disconnect switch or a circuit breaker shall be installed and shall be connected into the power supply line to the driving machine motor. Disconnect switches or circuit breakers shall be of the manually closed multipole type. Circuit breakers where used as a disconnect means, shall not be of the instantaneous type and shall not be opened automatically by a fire alarm system.

(b) Wiring and Wiring Methods. Electrical conductors shall be encased in rigid metal conduit, electrical metallic tubing or in metal wireways, securely fastened to the supporting structure. Flexible conduit or armored cables may be used for connecting safety and operating switches to main wellway conductors. Flexible leads may be used within the machinery spaces. The installation of all electrical wiring shall conform to the requirements of the Massachusetts Electrical Code (527 CMR 12.00).

(c) Operating and Control Circuit Voltages. The maximum system or circuit potential shall not exceed:

1. For operating, safety and signal circuits: 300 volts except that higher potentials may be used for frequencies of 25 through 60 cycles alternating current or for direct current; provided the current in the system cannot under normal conditions exceed eight milliamps for alternating current or 30 milliamps for direct current.

2. For control circuits, driving machine motors, electrically released brakes and motor generator sets: 600 volts except that higher potentials may be used for driving motors of motor generator sets.

(d) Enclosure of Electrical Parts. All electrical switches and controllers shall be enclosed to protect against accidental contact.

(e) Lighting of Machine Room. Permanent artificial lighting shall be provided in every machine room.

(f) Lighting of Landings. Landings shall be illuminated with light intensity of not less than five foot candles. The illumination should be of uniform intensity and should not contrast materially with that of the surrounding area.

30.05: Required Protection of Floor Openings

Where a moving walk pierces a building floor, the opening shall be protected against the passage of smoke, gases or flame in the event of fire in conformity with the following:

(1) Moving Walks Accredited as Required Means of Egress. Moving walks shall be fully enclosed in accordance with requirements of local laws and ordinances pertaining to required interior stairways.

(2) Moving Walks Not Accredited as Required Means of Egress. Moving walks shall have the floor openings protected by any one of the following generally recognized methods or by other methods which may be established as adequate by competent agencies:

(a) Full enclosures specified in 524 CMR 30.05(1).

(b) Kiosks conforming to the requirements of the National Building Code (1955) of the National Board of Fire Underwriters, Section 604.4.4--(4).

(c) Automatic rolling shutters conforming to the requirements of the Building Exits Code, of the National Fire Protection Association, NFPA No. 101–1960, Sections 4341 through 4347.

(d) Sprinkler method (in buildings where the area in which the moving walk is located is fully protected by a supervised automatic sprinkler system) consisting of individually operating sprinklers so spaced as to protect the exposed sides of the floor openings. A heat apron shall be provided to bank heat around the sprinkler heads adjacent to the opening. The lower edge of the apron shall be not less than six inches below the bottom of the sprinkler heads.

In buildings of 50,000 cubic feet or less, it is recommended that the sprinkler arrangement be supplemented by an automatically controlled exhaust system to create a down draft through the floor opening.

NOTE: In buildings of this size, excessive quantities of smoke or gas may pass through the openings before the temperature rises to a point where the sprinklers will operate.

30.05: continued

(e) Spray nozzles (only where the building area is fully protected by a supervised automatic sprinkler system) conforming to the requirements of the Building Exits Code of the National Fire Protection Association, NFPA No. 101--1960, Sections 4331 through 4339.

Exception: The floor opening protection is not required for moving walks that are not accredited as required means of egress, and which connect floors permitted by local laws and ordinances to be connected by unenclosed stairways.

NOTE: If the material is in full compliance with the codes and numbers as given, it will be deemed acceptable.

NOTE: It is not the intent to recommend one of the methods outlined above over another, nor to prohibit consideration of other methods which may be established by competent agencies.

30.06: Required Protection of Supports and Machine Spaces Against Fire

The sides and undersides of the supporting structure and the machinery and control spaces shall be enclosed with fire-resistive material. Means may be provided for adequate ventilation of machine and control space.

30.07: Tests and Inspections

(1) Acceptance Inspections and Tests.

(a) Inspections and Tests Required. In order to insure the safe operation of new moving walks, such devices shall, on their completion and before being placed in service, be subjected to an acceptance inspection and tests in the field to determine that all parts of the installation conform to the applicable code requirements and that all safety devices function as intended.

(b) Persons Authorized to Make Acceptance Inspections and Tests.

Acceptance inspections and tests shall be made by the following:

1. Inspections, by an inspector employed by the enforcing authority.
2. Tests, by licensed elevator mechanics in the presence of the inspector employed by the enforcing authority.

(c) Test Requirements. Operating and safety devices of moving walks required by 524 CMR 30.04(1) shall be tested with no load on the treadway by operating each of the safety devices manually.

(2) Periodic Inspections and Tests.

(a) Inspections and Tests Required. All existing installations and all new installations after being placed in service, shall be subjected to periodic inspections and tests at intervals not longer than six months to determine that the equipment is in a safe operating condition.

(b) Persons Authorized to Make Periodic Inspections and Tests. Periodic inspections shall be made by the inspector having jurisdiction.

The owner or his authorized agent shall have the periodic tests required by 524 CMR 30.07 made by a person qualified to perform such services in the presence of the inspector in the employ of, or authorized by, the enforcing authority.

(c) Inspection and Test Requirements. All parts of the equipment shall be inspected to determine that they are in a safe operating condition and that parts subject to wear have not worn to such an extent as to affect the safe operation of the installation.

Tests shall be made of all operating and safety devices required by 524 CMR 30.04(1) with no load on the treadway by operating the devices by hand.

REGULATORY AUTHORITY

524 CMR 30.00: M.G.L. c. 143, § 69.

524 CMR 31.00: CASKET LIFTS INSTALLED IN LICENSED FUNERAL HOMES, MEMORIAL CHAPELS, OR PREPARATION ROOMS

Section

31.01: Definitions
31.02: Requirements

31.01: Definition

The term casket lift shall mean a car, cage, or platform raised or lowered substantially vertical in permanent guides or rails, including the necessary operating mechanism and used for the purpose of transporting caskets and related materials only. The lift shall be operated only from the landing by continuous pressure key-operated switch. No person shall be permitted to ride on the car.

31.02: Requirements

(1) Hoistway Enclosures.

(a) The hoistway shall be of two hours fire resistive construction. The inside of the hoistway shall be of smooth finish without any projections or recesses except for landing entrances, guides and guide brackets, vertical slots when used for concealed guides, junction boxes and conduits for wiring.

'Exceptions: Where casket lifts serve only one floor not exceeding 15' travel a hinged vertical lifting hoistway cover shall be permitted when the lifting arms on the car will open and close the hoistway cover automatically, and provided the key operated switch is located only at the hoistway cover landing. The hoistway cover shall be installed to automatically close when the car leaves the upper landing opening.

(b) Hoistway covers shall be made of not thinner than ⅞ inches stock strongly battened if of wood or of equally strong and steel metal construction and shall support a load of not less than 1,000 lbs. Hinges shall be of either T or heavy strap hinges secured to the floor with lag screws or otherwise bolted through the hoistway cover.

(c) All projections or recesses at landing shall be bevelled on the underside, or shall be guarded with metal plates. The angle of such bevels shall be not less than 60° or more than 75° from the horizontal.

(2) Ventilation. Not compulsory if not required by cities and towns in the Commonwealth.

(3) Pits. A pit shall be provided at the bottom of every hoistway when the car is at the lowest landing, and the distance between the lowest point of the car platform framing and to the floor of the pit shall not be less than five inches. The clearance between the car and the hoistway shall not exceed 1½".

(4) Hoistway Doors. All landing openings shall be protected by swing or horizontal slide doors of solid construction and a fire test of 1½ hours fire rated assembly.

(5) Door Clearance. Landing doors shall be so located that the distance from the face of the doors to the edge of the hoistway shall not be more than four inches from the face of the door section nearest to the car.

(6) Vision Panels. Each door shall be provided with a vision panel not less than 20 square inches and the total area of one or more vision panels in any door shall be not more than 80 square inches. Each clear panel opening shall reject a ball six inches in diameter.

(7) Interlocks. All landing doors shall be equipped with electro-mechanical interlocks.

(8) Car Platform. The car platform size shall not exceed 96" long by 40" deep.

31.02: continued

(9) Car Floor. The car floor shall be wood plank or steel plate supported by a steel frame.

(10) Car Enclosure. Casket lifts shall be enclosed with solid sheet steel partitions on the unused sides not less than 42" wide and 42" in height and shall be flush.

(11) Capacity. The full load capacity shall not exceed 750 lbs.

(12) Speed. The contract speed shall not exceed 25 feet per minute.

(13) Travel. The total travel of lifts serving more than one floor shall not exceed 25'.

(14) Control Operation. The car shall be operated from the landing opening only by key-operated continuous pressure switch.

(15) Guide Rails. Steel guides shall be used on all installations.

(16) Car Safety. Cars suspended by ropes or chains of the winding drum type shall be provided with a car safety located within the car frame. The safety shall be of the instantaneous type.

(17) Machines.
- (a) May be of the winding drum type.
- (b) May be of the traction type.
- (c) May be of the hydraulic type.
- (d) The installation of belt-driven and chain drive machines are prohibited.

(18) Hydraulic Electric Systems. The electric system shall be so interlocked that due to electrical power failure, the car platform will remain in the position to the power failure and will move only on the resumption of power when the operating key switch is activated to start operation.

(19) Hydraulic Valves. An overload relief valve shall be installed in the hydraulic circuit to prevent operation of the platform if loaded above rated capacity.

(20) Mechanical Stops. Mechanical stops shall be installed to prevent lifting platform from traveling above the predetermined level.

(21) . Hydraulic Piping and Connections. Flexible hose and fittings may be installed between the check valve or control valve and cylinder if they comply with the following requirements: Steel wire reinforced rubber covered hose shall have a bursting strength of ten times working pressure and the replacement date shall not be less than six years beyond the installation date.

(22) Ropes and Chains. Car platforms suspended by ropes or chains shall have not less than 2⅜" steel ropes or equivalent number of steel roller or multiple link steel chains. Rope or chain fastenings may be thimbles and clamps or other approved type of fastening.

(23) Safety Factor. Suspension of car platforms by ropes or chains shall be not less than six.

(24) Slack - Rope - Chain. A slack rope or slack chain switch shall be installed in connection with all machinery of the winding drum type which will automatically shut off the power and apply the brake and stop the machinery, if the load carrying platform is obstructed in its descent.

(25) Voltage. The maximum system or circuit potential permitted in the hoistway or landing operating devices shall not exceed 240 volts.

31.02: continued

(26) Riders. All persons are prohibited from riding on a casket lift.

(27) Signs. A sign shall be provided on the car in a conspicuous location with letters at least one inch reading *CAPACITY 750 POUNDS*. A sign shall be located on the car reading *NO RIDERS* with letters one inch high.

(28) Casket Lift Regulations. Casket lift installations are not designed as freight elevators, which require conformity with all Massachusetts elevator code regulations.

(29) Inspection and Tests. Upon completion of the work of installations or alterations, the licensed elevator mechanic making the installation or alterations shall make a practical test of the devices in the presence of a qualified licensed elevator inspector. A full report within ten days after the inspection shall be made by the inspector to the Commissioner of Public Safety upon forms furnished by him. The owner or his agent in a building in which a lift is installed or altered shall arrange for an inspection with the authorized division of state, city or town inspection department of not less than one year.

(30) Plans. No casket lift shall be installed or altered until plans and specifications of such installations or proposed alterations shall have been filed by the owner of the premises where the lift is to be installed or altered with the inspector or manufacturer, and a certificate of approval of requirements shall have been issued by him.

(31) Fees. As required by state, city or town requirements.

REGULATORY AUTHORITY

524 CMR 31.00: M.G.L. c. 143, § 69.

NON-TEXT PAGE

524 CMR 32.00: INCLINED CHAIR/PLATFORM LIFTS

Section

32.01: Definition of Inclined Chair/Platform Lift
32.02: Capacity and Rated Load of Inclined Chair/Platform Lift
32.03: Conditions for Location
32.04: Rated Speed of Inclined Chair/Platform Lift
32.05: Carriage and Platform Construction
32.06: Safety Factor of Inclined Chair/Platform Lift
32.07: Anchoring Carriage
32.08: Track and/or Guide Rail Construction
32.09: Power Unit Location
32.10: Safety Devices
32.11: Cables or Ropes
32.12: Terminal Stopping Devices
32.13: Operating Controls of Inclined Chair/Platform Lift

32.01: Definition of Inclined Chair/Platform Lift

An inclined chair/platform lift for disabled persons means a hoisting and lowering mechanism with one chair or platform installed on a stairway for the purpose of transporting a single disabled or handicapped person and shall not serve more than two consecutive floors traveling a distance of not more than 40' on the incline and not more than 15' on the vertical.

32.02: Capacity and Rated Load of Inclined Chair/Platform Lift

The capacity and rated load shall be the following:

(1) The capacity shall be limited to one person.

(2) The rated load shall not be less than 500 lbs. nor more than 750 lbs.

32.03: Conditions for Location

The following conditions shall be considered for location of a stairway inclined chair/platform lift.

(1) The inclined chair/platform lift shall not be installed on stairway locations which will interfere with or obstruct legal egress from the buildings as required by state or municipal laws.

32.04: Rated Speed of Inclined Chair/Platform Lift

The rated speed shall not exceed 35 feet per minute.

32.05: Carriage and Platform Construction

(1) The carriage chair shall be constructed in the following manner:
(a) There shall be a seat with back and a foot platform.
(b) The seat shall have handgrips on both sides of the seat so arranged as to provide safe support for the passenger.
(c) A safety belt shall be provided and equipped with a fastening device.
(d) A swivel seat (or an adequate overrun may be provided in lieu of the swivel chair) shall be provided to facilitate use of the carriage.
(e) The swivel seat shall be equipped with an electric control switch which shall prevent operation when the carriage is not in operating position. If installed in a private residence, 524 CMR 32.05(1)(e) is not required.
(f) All structural parts shall be fabricated from metal. Cast iron shall not be used.
(g) The rated capacity shall not be less than 500 lbs.

32.05: continued

(2) The platform lift shall be constructed as follows:

(a) All exposed equipment on the device shall be guarded to protect against accidental contact which could cause bodily injury.

(b) An approved guard shall be provided on any side of the platform which is not guarded.

(c) A metal guard not less than one-eighth inch thick and six inches high shall be provided the full width of the platform to prevent a wheelchair from rolling off the lower access end of the platform when in use. The guard may be actuated automatically by movement from the landing.

(d) A ramp shall be provided, as required, for access to and from the platform and shall safely carry the load.

(e) The frame of a device shall be constructed of metal.

(f) The platform shall not be more than 36" wide by 48" long.

(g) The rated capacity shall be not less than 500 lbs.

32.06: Safety Factor of Inclined Chair/Platform Lift

The factor of safety used in the design of the hoisting engine, carriage, truck, guide rails, sprockets and sheaves shall not be less than five, based on the rated load.

32.07: Anchoring Carriage

The carriage shall be securely anchored to a truck which supports it. The truck shall be retained in a track or guide rail assembly.

32.08: Track and/or Guide Rail Construction

The track and/or guide rail shall conform to the following requirements:

(1) The supporting guide rails shall be securely anchored to the stairs or side wall.

(2) The rail and all supporting brackets shall be of metal construction. Cast iron shall not be used.

32.09: Power Unit Location

The power unit may be located in a remote location or mounted on the carriage. If remotely located, all intervening sheaves, sprockets or guides shall be properly aligned and properly enclosed or guarded.

32.10: Safety Devices

The following safety devices shall be provided:

(1) The carriage, unless equipped with positive self-locking gearing, shall be provided with an instantaneous type safety set to trip not more than 20% over the rated speed.

(2) Positive self-locking gearing on the carriage shall stop and hold the carriage with rated load within four inches of down travel when power is removed.

(3) A slack rope switch shall be provided for every hoisting rope which shall remove power from the hoisting engine if the rope should slacken or fail. The switch shall not be connected to an automatic resetting relay.

32.11: Cables or Ropes

Any hoisting engine having cables or ropes and motor shall conform to the following requirements:

32:11: Continued

(1) The winding drum and sheaves shall be of cast iron or steel and the diameter shall be not less than 30 times the diameter of the wire hoisting rope except that where 8 x 19 elevator wire rope of 7 x 19 aircraft cable is used as a connecting means between the carriage and the driving machine the diameter of drums and sheaves may be reduced to 21 times the diameter of the rope or cable.

(2) Machined rope grooves shall be provided in the drum and the sheaves.

(3) The carriage shall be connected to the drum by wire rope or cable. The rope shall be either of the following:
  (a) Steel or iron elevator rope not less than ¼" in diameter.
  (b) Steel aircraft cable of not less than ⅛" in diameter.

(4) The wire rope or cable shall have a factor of safety not less than seven based on the tension in the rope or cable when raising the carriage and its rated load. In no case shall the rated breaking strength of any cable be less than 1,800 lbs.

(5) A machine brake which is electrically released and spring applied shall be installed directly on the hoisting engine. The brake shall set when any safety device functions. Exception: Self-locking drives utilizing a lead screw or other positive gearing which will stop and hold the carriage with rated load within four inches of down travel after power is removed.

(6) The motor shall be directly connected to the hoisting engine or may be connected by roller chair, cog belt, or multiple V-belts. When chain, cog belt or V-belts are used, a broken chair or broken belt device shall be installed and shall remove power and set machine brake if chain or belt fails or slackens.

(7) Hoisting rope or cable shall be individually attached to carriage or hoisting engine by tapered babbitted rope sockets or compression clamp type fastenings. "U" bolt type clamps shall not be used.

32.12: Terminal Stopping Devices

The following terminal stopping devices shall be provided for all inclined chair/platform lifts:

(1) Upper and lower terminal stopping switches shall be provided for all inclined chair/platform lifts.

(2) Final stopping switches shall be provided which limit the travel of the carriage in both directions. These switches shall be set to stop the carriage if it should over-travel the normal stopping point.

(3) The terminal and final stopping switches shall not control the same switches on the controller unless two or more separate and independent switches are provided, two of which shall be closed to complete the motor and brake circuits in each direction of travel.

32.13: Operating Controls of Inclined Chair/Platform Lift

The operating controls shall conform to the following:

(1) Controls shall be placed at both top and bottom terminals and so located to provide unobstructed visibility for the full travel distance.

(2) The control shall be of a key operated continuous pressure type. The control shall be at all times kept locked except when in use. The key shall be removable in the "off" position only. If installed at a private residence, key operation will not be required.

(3) Controls must be installed on the carriage.

32.14: Inspection and Tests

Upon Completion of the work of installation or alterations, the licensed elevator mechanic making the installation or alterations shall make a practical test of the devices in the presence of a qualified licensed elevator inspector. A full report within ten days after the inspection shall be made by the inspector to the Commissioner of Public Safety on forms furnished by him. The owner or his agent in a building in which a lift is installed or altered shall arrange for an inspection with the authorized division of state, city or town inspection department every five years thereafter.

REGULATORY AUTHORITY

524 CMR 32.00: M.G.L. c. 143, § 68, 69; c. 22, § 11.

524 CMR 33.00: LOADING CLASSIFICATIONS

Section

33.01: Car Frame Uprights (Stiles)
33.02: Freight Elevator Platform Frames
33.03: Formula Symbols

33.01: Car Frame Uprights (Stiles)

The total stress in each car frame upright, due to tension and bending and the slenderness ratio of each upright and its moment of inertia, shall be determined in accordance with the following formulas:

(1) Stress Due to Bending and Tension.

$$\text{Total Stress} = \frac{KL}{4HZ_u} + \frac{G}{2A}$$

Where $\frac{KL}{4HZ_u}$ is the bending stress in each upright in the plane of the frame due to the live load W on the platform for the class of loading A, B or C for which the elevator is to be used (See Part 2, 524 CMR 33.03). K is determined by the following formulas:

(a) For Class A freight loading or passenger loading: $K = \frac{WE}{8}$

(b) For Class B freight loading: $K = \frac{WE}{2} \; \_\_ \; 48$

(c) For Class C freight loading: $K = \frac{WE}{4}$, and $\frac{G}{2A}$ is the tensile stress in each upright.

(2) Slenderness Ratio. The slenderness ratio L/R for uprights subject to compressions other than those resulting from safety and buffer action shall not exceed 120.

(3) Moment of Inertia. The moment of inertia of each upright shall be not less than determined by the following formula:

$$I = \frac{K(L)^3}{54 \times (10)^7 H}$$

33.02: Freight Elevator Platform Frames

The calculation of the stresses in the platform frame at the entrance of freight elevators, due to loading and unloading at the landings, shall be based on the following:

(1) For Class A loading: ¼ of the rated load shall be considered as being concentrated on the mid-point of the frame member.

ILLUSTRATION

Turning Moment Based on Class of Loading

(2) For Class B loading: 75% of the rated load shall be considered as being concentrated on the frame member supported at two points five feet apart, symmetrically located with respect to the mid-point of the member.

33.02: continued

(3) For Class C loading: 80% of the rated load shall be considered as being concentrated on the frame member supported at two points two feet six inches apart, symmetrically located with respect to the mid-point of the member.

33.03: Formula Symbols

The symbols used in the formulas in 524 CMR 33.00 shall have the following meanings:

W = Rated load in pounds.
C = Net weight in pounds of complete elevator car.
G = Load in pounds supported by crosshead with rated load in car at rest at top terminal landing.
K = Turning moment in inch-pounds as determined by class of loading.
D = Distance in inches between guide rails.
E = Inside clear width of car in inches.
H = Vertical center distance between upper and lower guide shoes (or rollers) in inches.
L = Free length of uprights in inches (distance from lowest fastening in crosshead to top fastening in plank).
A = Net area of section in (inches)2.
R = Least radius of gyration of section in inches.
I = Moment of inertia of member, gross section in (inches)4.
Z = Combined section moduli of plank members, gross section, (inches)8.
Z_u = Section modulus of one upright, gross section, (inches)^3.

REGULATORY AUTHORITY

524 CMR 33.00: M.G.L. c. 143, § 69.

524 CMR 34.00: VERTICAL WHEELCHAIR LIFTS

Section

34.01: Definition of Vertical Wheelchair Lift
34.02: Limitations
34.03: Capacity and Rated Load of Vertical Wheelchair Lift
34.04: Rated Speed of Vertical Wheelchair Lift
34.05: Platform and Ramps
34.06: Supports and Mechanism Housing
34.07: Safety Factor
34.08: Guarding
34.09: Controls and Electrical Equipment
34.10: Standards
34.11: Inspection and Tests

34.01: Definition of Vertical Wheelchair Lift

A vertical wheelchair lift is an electrically powered elevating device used to vertically raise and lower a person in a wheelchair from one level to another.

34.02: Limitations

The installation of lifts shall be restricted as follows:

(1) Vertical lift travel shall not exceed 12' from the bottom landing.

(2) Vertical lifts shall not be installed to service more than two floors, and shall not penetrate a floor.

(3) Vertical lifts may be installed adjacent to a porch, stairway, landing or at the end of a ramp or bridge, located indoors or out of doors.

34.03: Capacity and Rated Load of Vertical Wheelchair Lift

The rated load shall not be less than 500 lbs.

34.04: Rated Speed of Vertical Wheelchair Lift

The rated speed of the vertical wheelchair lift shall not exceed 20' per minute.

34.05: Platforms and Ramps

(1) The platform shall measure not less than 36" wide and shall have an area of not more than 12 square feet.

(2) The platform surface shall be constructed of material that is relatively smooth and skidproof.

(3) A ramp shall be provided, as required for access to the platform.

(4) A metal guard not less than ⅛" thick and six inches high shall be provided the full width of the platform to prevent a wheelchair from rolling off the lower access end of the platform when in use. The guard must be actuated automatically by movement from the landing and be raised to a minimum angle of 80°.

34.06: Supports and Mechanism Housing

(1) The assembled unit of a device shall be supported and maintained in place so as to prevent any part from becoming loose or displaced.

(2) Adequate support shall be provided to maintain the platform of the device in a level position at all times.

(3) The framework shall be securely anchored in place to a foundation.

(4) The motor, drive assembly, and all rollers and the tracks and struts they travel in must be totally enclosed by a protective covering.

34.07: Safety Factor

The frame and platform of a device shall be constructed of substantial metal capable of withstanding stresses of five times the rated load of the device. The safety factor of five shall be certified by a registered professional engineer who will affix his signature and seal to the certification.

34.08: Guarding

(1) The platform shall be guarded at the sides not used for entrance or exit to a height of 42" of solid metal construction.

(2) Entrance doors or gates are required for the top terminal landing. The opposite entrance on the platform shall have a car riding gate. These doors and gates shall be self-closing and self-locking and shall be equipped with an electric contact that will stop the device if the gate is opened.

(a) The door/gate at the bottom shall not be less than 42 inches in height.

(b) Maximum pressure required to open the doors or gates shall not exceed eight pounds.

(c) The door or gate may be opened only if the platform is within two inches of that level. If in a private residence, the top landing gate shall have a spring hinge to close the gate and a substantial locking latch.

34.09: Controls and Electrical Equipment

(1) The operating control shall be of the key operated constant pressure type.

(2) An upper and lower terminal stopping switch shall be provided to stop a device at the upper and lower terminal landing.

(3) The platform shall be equipped with a pan type electrical stop switch located under the platform to stop the down travel of the platform if the platform is obstructed in its downward travel by a force not exceeding four pounds.

(4) Platform enclosure shall be equipped with a stop switch and an alarm in public buildings.

34.10: Standards

(1) All hand operated controls whether mounted on machine or in remote locations are to be served by a 24 volt system. Unless otherwise indicated, electrical wiring and components in the vertical wheelchair lift and its installation shall comply with the Massachusetts Electrical Code.

(2) All welding shall be done in accordance with standard industry practices.

34.11: Inspection and Tests

Upon completion of the work of installation or alterations, the licensed elevator mechanic making the installation or alterations shall make a practical test of the devices in the presence of a qualified licensed elevator inspector. A full report within ten days after the inspection shall be made by the inspector to the Commissioner of Public Safety on forms furnished by him. The owner or his agent in a building in which a lift is installed or altered shall arrange for an inspection with the authorized division of state, city or town inspection department every five years thereafter.

REGULATORY AUTHORITY

524 CMR 34.00: M.G.L. c. 143, §§ 68, and 69; c. 22, § 11.

NON-TEXT PAGE

524 CMR 35:00: SAFETY CODE FOR ELEVATORS AND ESCALATORS (ASME/ANSI/ A17.1. 1990 and A17.1a-1991 ADDENDA EDITIONS) AND THE MASSACHUSETTS MODIFICATIONS.

Massachusetts incorporates by reference the ASME - ANSI A17.1 1990 and A17.1a 1991 Addenda Editions with the following modifications.

524 CMR 21.00, 25.00, 26.00, 29.00 and 31.00 shall apply in Massachusetts.

SECTION 100: CONSTRUCTION OF HOISTWAYS AND HOISTWAY ENCLOSURES:

100.1 HOISTWAY ENCLOSURES

Delete Rule 100.1a, 100.1b, 100.1c & 100.1d and insert the following:

100.1a Fire-Resistive Construction

(1) The hoistways of all elevators shall be enclosed throughout their height and shall be of two hour fire rated construction.

(2) Elevator hoistways exposed to wheeled traffic shall be so designed as to withstand the impact of loads of such traffic.

(3) Where the elevator serves only open construction floors or open balcony floors within one story, the hoistway wall shall be of non-combustible material.

(4) Partitions between fire resistive hoistways and machine rooms having fire resistive enclosures and which are located at the side or beneath the hoistway may be of unperforated non-combustible material at least equal to 0.0598 in. (1.519 mm) thick sheet steel in strength and thickness with openings therein essential for ropes, drums, sheaves and other elevator equipment.

(5) All hoistway openings shall be provided with fire resistive protective labeled assemblies. The fire resistive rating shall not be less than 1½ hours when installed in a two hour fire resistive rated construction.

100.1b Not Applicable In Massachusetts

100.1c Partially enclosed hoistways:

(1) Walls of elevators which are required by the building code to be fire resistive, shall conform to the requirements of Rule 100.1a.

(2) Elevators not fully enclosed. Walls of elevators which are not fully enclosed, protection shall be provided adjacent to areas permitting the passage of people,(e.g. passageways, stairways, and elevator landings.) This protection shall be fixed solid guards seven foot minimum in height and sufficient distance from the moving portion of the elevator so that individuals cannot come in contact with the elevator.

(3) Hoistway glass panels

Delete from 524 CMR modifications the requirements for glass panel detectors, when it is shown that the glass panels of a hoistway enclosure are of sufficient strength, properly installed, of laminated safety glass and meet all other requirements of ANSI- Z97-1.

100.1d Multiple Hoistways. Not more than four elevators shall be installed in the same hoistway.

100.2 Construction at Top and Bottom of Hoistway

100.2a Not Applicable in Massachusetts (refer to 524 CMR 17.01(7)(8) (ventilation)

Section 100: continued

Delete 100.4 and insert the following:

100.4 Control of Smoke and Hot Gases is superseded by 524 CMR 17.03(1) through (4) inclusive. Add the following as 100.4a:

100.4a Where air pressurization of the hoistway is utilized as a means of smoke and hot gas control, the air shall not be introduced into the hoistway in such a manner as to cause erratic operation by impingement of traveling cables, selector tapes, governor ropes, compensating ropes, and other components sensitive to excessive movement or deflection.

Delete 100.5 and replace it with the following:

100.5 Windows and Skylights

100.5a Window and Skylight Frames and Sash. Window and skylight frames and sash shall be of metal.

100.5b Skylight Guards. A guard, securely anchored to the supporting structure, consisting of a wire-mesh screen of at least #13 steel wire gauge with openings which will reject a ball one inch in diameter, or an expanded metal screen of equivalent strength and open area, shall be installed above every elevator skylight. A similar screen of at least #18 steel wire gauge or of expanded metal or equivalent strength and open area, shall be installed below every elevator skylight.

100.5c Windows. All windows in hoistway enclosures are prohibited.

SECTION 101
MACHINE ROOMS AND MACHINERY SPACES

Delete 101.1a and 101.1b insert the following text:

101.1a Enclosures Required for Elevators having Fire-Resistive Hoistway Enclosures.

(1) Spaces containing machines, control equipment, sheaves and other machinery shall be protected from the weather, and shall be enclosed with two hour fire-resistive enclosures.

(2) Enclosures and access doors thereto shall have a fire endurance at least equal to that required for the hoistway enclosure and the hoistway doors, respectively.

NOTE: (Rule 101.1a): See Rule 100.3 for floors of machine rooms and machinery spaces over hoistways.

101.1b Not Applicable in Massachusetts

101.2 Equipment in Machine Rooms and Clearances.

Delete 101.2a and 101.2b insert the following text:

101.2a No machinery, equipment, water lines, drainage lines or other equipment shall be located in or pass through the machine room, except as required in 524 CMR 35.00 102.2(3)c.

Add new paragraph:

101.2a(1) Machine room HVAC. Elevator machinery spaces that require HVAC to maintain their temperature shall not locate the units needed for that purpose within the walls of the machine room.

Section 101: continued

101.2b Machine room walls shall not be less than two feet from the front and not less than two feet from any side of the elevator related equipment.
EXCEPTION: Governor to be no less than one foot from adjacent wall.

101.3 Access to Machine Rooms and Machinery Spaces

Delete 101.3a insert the following text:

101.3a General requirements. A permanent, safe and convenient means of access to elevator machine rooms and overhead machinery spaces shall be provided for licensed elevator constructors, maintenance or repair persons.

Delete 101.3d(3)(b) and insert the following text:

101.3d(3)(b) be a width of 30" and a height of 30".

101.3d(3)(c) be provided with doors which shall be kept closed and locked and electrically contacted.

Add new paragraph 101.5a(1) Light switches

Motion or heat detecting light activating devices used to turn, (on or off) the lights in the machine room, pit, car, or the car top are prohibited.

Delete 101.5b insert the following text:

101.5b Ventilation for Machinery and Control Equipment. Machine rooms shall be provided with natural or mechanical ventilation to avoid overheating of the electrical equipment and to ensure safe and normal operation of the elevator. Temperatures shall be maintained as required by the elevator supplier but not less than 50° F or more than 90° F.

SECTION 102
ELECTRICAL EQUIPMENT, WIRING, PIPES, AND DUCTS IN HOISTWAYS AND MACHINE ROOMS

Delete 102.1 insert the following:

102.1 Installation of electrical equipment and Wiring in Hoistways and Machine Rooms. All electrical equipment and wiring shall conform to the requirements of 527 CMR 12.00: The Massachusetts Electrical Code.

Only such electrical wiring, raceways, and cables used directly in connection with the elevator, including wiring for signals, for communication with the car, for lighting, heating, air conditioning and ventilating the car, for fire-detecting systems, for pit sump pumps, and for heating and lighting the hoistway, may be installed inside the hoistway in accordance with the requirements of 527 CMR 12.00: The Massachusetts Electrical Code.

Delete 102.2(3)(c) insert the following:

102.2(3)(c) Sprinklers are prohibited in elevator machine rooms and hoistways but shall be allowed in machine rooms in conjunction with the use of smoke detectors, heat detectors, shunt trip type circuit breakers and high temperature sprinkler heads.

SECTION 110
PROTECTION OF HOISTWAY-LANDING OPENINGS

Delete 110.1(f) & (g) insert the following:

> 110.1(f) It shall be unlocked from the landing side only through the use of a 3502 key. The lock shall:
> (1) be so designed that the key shall be removable only in the locked position.

New paragraph:

> 110.1(g) The key shall be available only to authorized persons, see Massachusetts Modifications paragraph 211.8 The use of combination locks is prohibited in Massachusetts.

Delete: 110.13(e) Not Applicable In Massachusetts.

SECTION 111
HOISTWAY DOOR LOCKING DEVICES, CAR DOOR OR GATE ELECTRIC CONTACTS, HOISTWAY ACCESS SWITCHES, AND ELEVATOR PARKING DEVICES

Delete 111.1(b) and insert:

> 111.1b For Freight Elevators. Hoistway doors shall be equipped with hoistway unit system hoistway door interlocks.

Delete 111.3b(4) Not Applicable In Massachusetts.

Delete 111.9d Prohibited In Massachusetts

Delete 111.9e Prohibited In Massachusetts

Delete 111.10 Prohibited In Massachusetts

SECTION 200
CAR AND COUNTERWEIGHT GUIDE RAILS, GUIDE RAIL SUPPORTS AND FASTENINGS

Delete 200.11 insert the following:

> 200.11 Information on Elevator Layouts. Applications and elevator layouts must be filed and approved before any work can begin. Elevator layout drawings shall, in addition to other date, indicate the following:
> (a) The bracket spacing
> (b) The estimated maximum vertical forces on the guide rails on application of the safety device.
> (c) In the case of freight elevators for Class B or C loading (see rule 202.2(b)), the horizontal forces on the guide rail faces during loading and unloading and the estimated maximum horizontal forces in a post wise direction on the guide rail faces on the application of the safety device.
> (d) The size and weight per foot of any rail reinforcements where provided,
> (e) All plans for elevator installations shall be signed by a registered professional engineer or a registered architect and shall bear his registering stamp certifying that he has examined the plans and finds that the hoistway structure including the support as shown on the plans will comply with the contract load plus its tare. The complete elevator installation shall comply with 527 CMR 12.00 the Massachusetts Elevator Code now in effect.
> (f) Type of hoistway material to be used.
> (g) Height of hoistway in regard to roof of building. Fire rating of building roof.
> (h) Location of hoistway and machine room vents, size of vents.
> (i) Location of the machine room.

Section 110: continued

(j) Type of hoistway doors, fire rating of doors must be shown on the layout, filling around hoistway door frames and headers for proper fire rating, grouting of landing sills.
(k) Type of approved interlock.
(l) Buffers, type and rating.
(m) Governor, type and name plate depicting tripping speed, and over speed switch material of governor rope and size.
(n) Hoist rope: size, number and breaking strength.
(o) Type of safeties and location.
(p) Type of drive machine, speed and capacity.
(q) Type of control. Voltage and amps.

Delete203.8b Not applicable in Massachusetts.

Delete204.1h Not applicable in Massachusetts insert the following:

204.1h Glass in Elevator Cars. Glass exceeding one square foot in area when used in elevator cars shall:

(1) be laminated.

(2) meet the requirements for laminated glass of ANSI Z97.1 except as to transparency.

(3) be installed and guarded as to provide adequate protection for passengers in case the glass panels break or are dislodged. Said protection shall consist of electrical supervision or detection which will cause the elevator to shut down in the event of glass breakage or dislodgement.

(4) be so mounted in the structure that the structure, including the glass in place, shall withstand the required elevator tests without damage.

Delete 204.2a superseded by 524 CMR 17.14 (2)(a) through (g).

Add new paragraph 204.2(f) to read as follows:

No smoking sign to be posted in each elevator.

Delete 204.3a insert the following

204.3a Enclosure Material. Enclosures of all walls and top shall be of metal without perforations except for car gate(s).

Delete 204.5i Glass in elevator car doors. Not applicable in Massachusetts.

Delete 207.4 and insert

Freight elevators which are permitted to carry passengers shall conform to the requirements of 524 CMR 17.15(4).

Delete 208.9 Indirect-drive Machines

Such installations are prohibited in Massachusetts

Delete 210.4 Refer to 527 CMR 12.00 Massachusetts Electrical Code.

211.2 delete first paragraph and insert:

All elevators having a travel distance of 70 feet or more from the lowest accessible grade elevation surrounding the building shall be powered by a standby (emergency power system in accordance with 524 CMR 17.39(6)). All such systems will have automatic sequencing of the elevators to the designated fire service recall floor.

Section 200: continued

New paragraph 211.3a(12) Firemans Service

The phase one hall key switch shall be marked with the off position vertical and in the center, the on position to the right of center and the by-pass position to the left of center.

New paragraph 211.3a(13)

If a second, phase one two position key switch is installed, it shall only be located at the fire control center.

New paragraph 211.3c(5c)

Modify A17.1a, 211.3c, 5 add new "c": Car shall close its doors and return to the recall floor when the phase two key in the car is turned to the off position. During the door close cycle, if the key is turned to the hold position the door will re-open and the car will remain at the floor. If the key is turned from the off position to the on position during the return of the car to the recall floor the car shall immediately return to phase two operation and stop at the next available floor.

Delete 211.7 Not applicable in Massachusetts

Delete 211.8 and insert the following:

New paragraph 211.8

Fire service shall be activated only with the use of the 3502 key and cylinder.
The possession of the Massachusetts Fire Fighters key number 3502 shall be limited to fire department personnel, licensed mechanics and inspectors only.

New paragraph 211.10

All existing fireman service operation shall be brought up to the operation of that service as described in the current A17.1a 1991 code by January 1, 1996.

PART III
HYDRAULIC ELEVATORS
SECTION 300 HOISTWAYS, HOISTWAY ENCLOSURES, AND RELATED CONSTRUCTION

Delete 300.2 insert the following:

300.2 Machine rooms and machinery spaces. Where pumps, motors, valves and electrical control equipment are located in spaces separated from the hoistway enclosure. They shall conform to Rule 101.1.

Add new paragraph 300.2a Hydraulic elevator machine rooms

When it is not possible to locate a machine room adjacent to the hoistway, in addition to all normal requirements the following provisions apply:

a. The oil pipe line shall be a minimum of schedule 80 pipe.

b. This pipe shall have no fittings, couplings or bends in it from the hoistway to the machine room.

c. The distance from the hoistway to the machine room shall not exceed ten feet.

d. The oil line shall be visible for inspection after installation.

e. A pipe rupture valve shall be installed at the jack.

f. A two way voice communication system shall be installed between the car and the machine room.

g. If machine room ventilation is accomplished by use of a horizontal duct, that duct shall be fire rated equal to that of the hoistway, and contain an exhaust fan powered from a normal and an emergency power source and be activated by both heat and smoke detectors in the machine room.

Section 300: continued

Add new paragraph 300.2(b)

All hydraulic elevator hoistways shall be ventilated to a minimum of 3-1/2% of the area of the hoistway with a minimum of three square feet. 1/3 of which to be permanently open to the atmosphere the other 2/3 shall be single pane glass.

Add new paragraph 300.2(c)

All hydraulic elevator machine rooms shall be ventilated to a minimum of 1% of the area of the machine room and a minimum of one sq. foot, said ventilation shall be located as close to the machine room ceiling as possible.

Delete 301.2 insert the following:

301.2a All plans for elevator installations shall be signed by a registered professional engineer or a registered architect and shall bear his registering stamp certifying that he has examined the plans and finds that the hoistway structure including the supports as shown on the plans will support the contract load of the elevator plus its tare.

301.2b Applications and elevator layouts must be filed and approved before any work can begin.

(1) Type of hoistway material to be used.
(2) Height of hoistway in regard to roof of building. Fire rating of building roof.
(3) Location of hoistway and machine room vents, size of vents.
(4) Location of the machine room.
(5) Type of hoistway doors, fire rating of doors must be shown on the layout; filling in around hoistway door frames and headers for proper fire rating, grouting of landing sills.
(6) Type of approved interlock.
(7) Buffers, type and rating.
(8) Governor, type and name plate depicting tripping speed and overspeed switch material of governor rope and size.
(9) Hoist rope, size, number and breaking strength.
(10) Type of safeties and location.
(11) Type of valve unit, pressure relief setting, piston size and travel.
(12) Type of drive machine, speed and capacity.
(13) Type of control. Voltage and amps.

Delete 303.1d insert the following:

303.1d Flexible hydraulic connections are prohibited between the pump and the cylinder.

Delete 303.3c insert the following:

303.3c Pipe lighter than schedule 40 shall not be used.

Add new paragraph:

303.3c(1) Pipe lighter than schedule 80 shall not be used underground or above ceiling panels and shall have no bends or turns between the hoistway and a remote machine room.

Delete 306.6 Prohibited in Massachusetts refer to 527 CMR 12.00 Massachusetts Electrical Code.

Add new paragraph

308 Hydraulic decommissioning. When a hydraulic elevator is taken out of service the oil pipe line from the hoistway to the power unit, and the oil in the tank will be removed from the premises. The supply wires shall be disconnected at the main line switch and at the power unit. All other decommissioning requirements of 524 CMR 11.00 also apply.

PART V
PRIVATE RESIDENCE ELEVATORS

Add new paragraph

500.1(d). Machine rooms, shall be enclosed with materials of the same fire rating as that required in the building in which they are installed; said machine rooms shall be kept locked at all times.

Delete 500.4(d)(1) & (2) insert the following:

Landing doors shall be provided with hoistway door interlocks.

Add new paragraph

506.4(1) Flexible Hose. Flexible hose shall not be installed between the power unit (pump) and the jack.

Delete 508.4 and insert

Electrical equipment & wiring. All electrical equipment shall conform to 527 CMR, 12.00 the Massachusetts Electrical Code.

Part VIII
Escalators

Delete 802.3e insert the following:

802.3e Clearance between skirt and step. The clearance on each side of the steps between the step thread and the adjacent skirt panel shall be not more than 1/8 inch.

Delete 802.4c insert the following:

802.4c Guards. Hand or finger guards shall be provided at the point where the rail enters the balustrade and it shall be electrically contacted to shut down the unit. This device shall operate when an object becomes caught between the guard and the hand rail.

Add 802.6a:

802.6a (4) Comb plates. add at end of paragraph. Means shall be provided to cause the opening of the power circuit, when any abnormal pressure is exerted on the comb plate this switch shall be of the manual reset type.

Delete 805.1d insert the following:

805.1d Broken step chain device. A broken step chain device with an electrical contact, manually reset shall be provided that will cause the interruption of power to the driving machine.
(1) if a step chain breaks, and
(2) where no automatic chain tension device is provided, if excessive sag occurs in either step chain.

Delete 805.1f insert the following:

805.1f Broken drive chain device. When the driving machine is connected to the main drive shaft by a chain, a device with an electrical contact and manually reset shall be provided which will disconnect power to the brake and will cause application of the brake on the main drive shaft and also stop the drive machine if the drive chain parts.

Section 800: continued

Delete 805.1m insert the following:

805.1m Step upthrust device. Means shall be provided to cause the opening of the power circuit and be of the manual reset type to the escalator driving machine motor and brake, should a step be displaced against the upthrust track at the lower curve in the passenger carrying line of the track system.

Delete 806.3 and 806.4 insert the following:

806.3 Access to interior. Reasonable access to the interior of the escalator shall be provided for inspection and maintenance. Access plates requiring no more than 70 lbf (311n) effort to open shall be provided at the top and bottom landings for inspection and maintenance. This access will be electrically contacted and render the escalator inoperative when open. The plates shall be made of material which will afford a secure foothold. The use of stone, terrazzo or concrete as a fill material is prohibited in panels within the confines of the escalator truss. If access doors are provided in the side of the escalator enclosure, they must be electrically contacted, be locked with a key and the key kept in a location accessible only to licensed elevator mechanics. The key shall be removed only when it is in the locked position.

806.4 Electrical equipment and wiring. All electrical equipment and wiring shall conform to 527 CMR 12.00: The Massachusetts Electrical Code.

PART IX
MOVING WALKS

Delete 905.1d insert the following:

905.1d Broken treadway device for belt pallet type and pallet type: A device shall be provided which will cause interruption of power to the driving machine and to the brake, where provided, if the connecting means between pallets or the belt breaks and shall be electrically contacted and be of the manual reset type.

Delete 905.1f insert the following:

905.1f Broken drive chain switch. Where the driving machine is connected to the main drive shaft by a chain and where a brake is located on the main drive shaft, a device shall be provided which will cause application of the main drive shaft brake should the drive chain part and shall be electrically contacted and be of the manual reset type.

PART X
ROUTINE, PERIODIC, AND ACCEPTANCE INSPECTIONS AND TESTS

FOR THE PURPOSES OF THE MASSACHUSETTS MODIFICATIONS, ACCEPTANCE, ROUTINE, PERIODIC AND ANNUAL TESTING SHALL MEAN A ONE YEAR TEST.

Delete 1000.1 Insert the following:

All inspections and tests shall be made by licensed elevator mechanics in the presence of a Commonwealth of Massachusetts inspector authorized to make inspections and tests.

Delete 1000.1b,1000.1c, 1000.2, 1000.3, 1001.1, 1002, 1003, 1004, 1005, 1006, 1007, 1008, 1009, 1010, 1011. Not Applicable in Massachusetts. Refer To M.G.L. c. 143, § 64.

Medical Emergency Elevators for requirements see 524 CMR 17.40 which applies to all new buildings.

PART XII Alterations, repairs, replacements and maintenance does not apply to existing elevators and escalators.

REGULATORY AUTHORITY

524 CMR 35.00: M.G.L. c. 143, § 69.

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